DRAFT Environmental Impact Statement

Tobias Ecosystem Restoration Project

Western Divide Ranger District, Sequoia National Forest

Tulare County, California

Lead Agency: USDA Forest Service

Responsible Official: Kevin B. Elliott, Forest Supervisor
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Typical conditions in Tobias Project Area

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Abstract:

The draft Environmental Impact Statement (DEIS) describes three alternatives developed to provide ecological restoration by thinning of dense, fire-suppressed tree stands and by prescribed burning. It would also remove hazard trees from public roadways. The project area is estimated at 11,000 acres in the Portuguese Pass area of southeastern Tulare County, with a small area within Kern County. Each alternative responds differently to the major issues and concerns identified during public and internal scoping. Alternative 1 is the no action alternative. Alternative 2 is the Proposed Action (commercial) as described in the Notice of Intent published in the Federal Register and the scoping letter dated February 6, 2015. Alternative 3 addresses potential adverse impacts on fuels, wildlife, visuals, soils, and watershed resources related to using mechanical equipment to thin trees larger than 8 inches in diameter by limiting thinning to hand thinning of trees less than 8 inches diameter. Alternative 2 is the preferred alternative because it provides a more balanced approach to addressing the short-term and long term ecological concerns and issues, while providing timber to the local wood industry.

Reviewers should provide the Forest Service with their comments during the review period of the draft environmental impact statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' position and contentions. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement. City of Angoon v. Hodel (9th Circuit, l986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

The opportunity to Comment ends 45 days following publication of the notice of availability (NOA) in the Federal Register.

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The acceptable format(s) for electronic comments is: [MS Word or Rich Text Format]

Summary

The Sequoia National Forest proposes ecological restoration in the Tobias Forest Ecosystem Restoration Project (Tobias Project). The 11,000 acres Tobias Project is located in the Greenhorn Mountains on the Western Divide Ranger District, between Alta Sierra and Johnsondale in Tulare County, California. This project proposes to treat 4,900 acre of the project area through commercially (ground skidding and skyline yarding) thinning stands of mature trees on approximately 1,100 acres, fuel reduction (hand thinning and mastication) on approximately 3,800 acres, and decommission 11 miles of Forest Service system roads. Tobias is a recovering landscape comprised of approximately 60 percent brush, meadows, and mixed conifer stands. The Tobias Project is anticipated to improve forest conditions and its representation across the landscape over the long term, a benefit for wildlife species at risk. This would be accomplished through brush manipulation, forest thinning, and re-introducing fire on the landscape.

A scoping letter was sent on May 8, 2013 for the proposed Tobias Forest Ecosystem Restoration Environmental Assessment Project. After reviewing public comments, interdisciplinary input on the proposed action, and further field surveys for soils, permanent streams, and meadows, decided to issue a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) in the Federal Register on August 15, 2014. After analyzing comments and further analysis, the proposed action several stands were changed from tractor logging to skyline, a second NOI was published in the Federal Register on February 6, 2015. The overall issues raised during internal and external scoping were suitability of soils and steep slopes for mechanical treatments, varying canopy cover needs for several wildlife species, and reducing the fuel load.

These issues led the agency to develop alternatives to the proposed action including: Alternative 2 (Commercial) proposes 4,898 acres of treatment through 1,100 acres of commercial thinning (approximately 700 tractor acres and 400 skyline acres), 5.5 miles of road reconstruction, 3,800 acres of non-commercial thinning (approximately 1,200 acres of hand treatments and 2,600 acres of mechanical mastication), and approximately 11.3 miles of road decommissioning. Alternative 3 includes approximately 3,000 acres of hand treatments, approximately 1,900 acres of mechanical mastication, and 11.3 miles of road decommissioning.

Major conclusions include: The outcome of these actions will improve forest heterogeneity, maintain desirable stand structure, increase forest distribution, and its resilience to natural disturbance regimes associated with the Sierra Nevada.

Based upon the effects of the alternatives, the responsible official will decide which alternative to select in the Record of Decision based on comments on the draft Environmental Impact Statement (DEIS and further analysis. Alternative 2 is the preferred alternative in the DEIS because it proved to be the most balanced approach to meeting the purpose and need of the Tobias Project.

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CHAPTER 1-PURPOSE OF AND NEED FOR ACTION

DOCUMENT STRUCTURE

The Forest Service prepared this environmental impact statement in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This environmental impact statement discloses the direct, indirect, and cumulative environmental effects that would most likely result from the proposed action and the alternatives. The document is organized into five parts:

1. ***Purpose of and Need for Action****:* Chapter 1 includes the background and history of the project area, the purpose of and need for the project, the public involvement process, and the issues identified from public comment.
2. ***Alternatives, including the Proposed Action****:* Chapter 2 contains a detailed description of the alternatives (including the no action, proposed action, and one other action alternative) This chapter also provides a comparison of the alternatives in a summary table of the activities and outputs expected with each alternative.
3. ***Affected Environment and Environmental Consequences****:* Chapter 3 describes the current conditions in the project area and the environmental impacts of the proposed action and alternatives.
4. ***Consultation and Coordination:*** Chapter 4 provides a list of preparers and the agencies consulted during the development of this environmental impact statement.
5. ***Appendices:*** The appendices provide more detailed information to support the analyses presented in the environmental impact statement. Including project maps and management direction.

Additional documentation, including more detailed analysis of project-area resources ~~is~~ are available in the specialist reports and project planning record at the Western Divide Ranger District Office in Springville, California.

BACKGROUND

The Tobias project is located in the Greenhorn Mountains of the Western Divide Ranger District, Sequoia National Forest, between Alta Sierra and Johnsondale in Tulare County, California, (Township 24 South, Range 32 East, Mount Diablo Base and Meridian) as shown on Map 1.

The Pacific Southwest Regional Forester's statement of leadership intent for ecological restoration states:

"Our goal for the Pacific Southwest Region[1] is to retain and restore ecological resilience of the National Forest lands to achieve sustainable ecosystems that provide a broad range of services to humans and other organisms."

"Our goal is based on a commitment to land and resource management that is infused by the principles of Ecological Restoration and driven by policies and practices that are dedicated to make land and water ecosystems more sustainable, more resilient, and healthier under current and future conditions." (http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5411375.pdf)

In order to attain the Regional Forester's goal, fuel reduction treatments in conifer forest types are needed in the Tobias Ecosystem Restoration project area. These treatment will reduce the size and severity of wildfire, fire intensity, and rate of spread, crown fire potential, and tree mortality. Planned fuel reduction treatments will provide greater capacity to adapt and thrive in the face of natural disturbances and large-scale threats to sustainability such as bug and insect infestation brought about by drought.

The Tobias Ecological Restoration Project (Tobias Project) consists primarily of Sierra mixed-conifer with areas of red fir, oak, pine plantations, chaparral, meadows, and annual grass. A history of logging, large wildfires, and 100 years of fire suppression, has resulted in a dense, second-growth forest at risk of drought, disease, and stand-replacing wildfire. The Tobias Project is designed to implement this leadership intent and move the landscape toward desired conditions identified in the Sequoia National Forest Land and Resource Management Plan (Sequoia LRMP), as amended by the Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) (2004).

The LRMP addresses the need for fuel reduction treatments in conifer forest types to reduce the size and severity of wildfire, fire intensity, rate of spread, crown fire potential, and tree mortality to achieve an average of 4-foot flame lengths under 90th percentile fire weather conditions (SNFPA ROD, pp. 49-50) identified in the Sequoia LRMP, as amended, and is consistent with the Mediated Settlement Agreement to the Sequoia LRMP (MSA 1990).

PURPOSE OF AND NEED FOR ACTION

The underlying needs for this proposal are to ecologically restore a healthy, diverse, forest ecosystem that is resilient to the effects of wildfire, drought, disease, and other disturbances. The project vegetation consists primarily of Sierra mixed-conifer with areas of red fir, oak, pine plantations, chaparral, meadows, and annual grass. A history of logging, large wildfires, and 100 years of fire suppression, has resulted in a dense, second-growth forest at risk of drought, disease, and stand-replacing wildfire.

To move the existing conditions toward desired conditions there is a need for:

- **Increasing diversity in forest age, density, and stand structure**. Current Forest structure does not include a diverse mosaic of stand structures, ages and size classes, with uneven-aged stands, natural regeneration, patches of openings and greater dominance of large trees (over 30 inches in diameter at breast height (dbh)).

Treatments are expected to accelerate restoration of late-successional/old forest conditions by

- **Modifying tree species composition** to favor oaks and pines over incense-cedar and white fir. Reduce shade-tolerant white fir *(Abies concolor)* and incense-cedar *(Libocedrus decurrens)* in stands. Improve forest resilience and fire adaptation to fire by increasing the pine-black oak dominated forest ecosystem historically found in the area.
- **Modifying fuel conditions** within the project area to reduce risk of uncharacteristically large, stand-replacing fires. Provide a condition where prescribed or naturally occurring fire can be safely re-introduced to the landscape.
- **Improving wildlife habitat** for resting, roosting, denning and nesting for sensitive, forest-dependent wildlife species, including the Pacific fisher, California spotted owl, California condor and goshawk. In this second-growth forest, suitable wildlife habitat is now limited by the small

size of the trees and the fragmentation of habitat. Sensitive habitats are also at risk of stand-replacing fire.

The treatment prescriptions will be based be on “what is left behind” rather than “what is taken.” Treatments will be accomplished by preparing economical, efficient projects that require the least outside funding to offset costs, and provide support for local economies, while not compromising other values. Excess woody material generated by forest thinning activities may be used for economic benefit to surrounding communities.

PROPOSED ACTION

The Proposed Action was developed to restore old forest stands and ecosystem structure, composition, and function over time. Treatments would modify wildfire behavior, create defensible space, and provide a safe and effective area for suppressing fire by treating surface fuels, and thinning small to intermediate sized trees (less than 30 inches in diameter).

Chapter 2 provides a more detailed description of the alternative starting on page 16.

DECISION FRAMEWORK

The Forest Supervisor of the Sequoia National Forest is the Deciding Officer. The Deciding Officer will consider the analysis in this environmental impact statement and the project record to select one of three alternatives: the no-action alternative, a non-commercial alternative, the proposed action, or a modification of the analyzed alternatives. The decision will be based on the current condition of the area, the desired condition of the area, management direction found in the Sequoia National Forest LRMP, as amended by the Sierra Nevada Forest Plan Amendment, 2004 (SNFPA 2004) and applicable law, regulation and policy.

FOREST PLAN DIRECTION

The Proposed Action and alternatives are guided by the Sequoia National Forest Land and Resource Management Plan (Sequoia LRMP), as amended by the Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) (2004). (USDA 1988), (USDA 2004). The Forest is subdivided into land allocations (management areas) with established desired conditions and associated management direction (standards and guidelines). Land allocations that apply to this proposal include: California spotted owl and northern goshawk PACs, home range core areas, wildland urban interface threat zones, southern Sierra fisher conservation area, and general forest.

DESIRED CONDITIONS:

The Sequoia LRMP, as amended, provides direction for designing and developing fuels and vegetation management projects in the Sequoia National Forest. In designing the strategic layout of treatments, managers ensure that treatment area patterns and prescriptions are consistent with or moving toward desired conditions, management intents, and management objectives for relevant land allocations. Desired conditions are goals, not standards. Short-term deviations or shortfalls in desired conditions may be acceptable to meet long-term goals, as opposed to standards that must be met.

OLD FOREST EMPHASIS AREA

Within Old Forest Emphasis Areas, forest structure and function generally resemble pre-settlement conditions. High levels of horizontal and vertical diversity exist at the landscape-scale. Stands are composed of roughly even-aged vegetation groups, varying in size, species composition, and structure.

Individual vegetation groups range from less than 0.5 to more than 5 acres in size. Tree sizes range from seedlings to very large diameter trees. Species composition varies by elevation, site productivity, and related environmental factors. Multi-tiered canopies, particularly in older forests, provide vertical heterogeneity. Dead trees, both standing and fallen, meet habitat needs of old-forest associated species. Where possible, areas treated to reduce fuel levels also provide for successful establishment of early seral vegetation (SNFPA ROD 2004, p. 41).

Southern Sierra Fisher Conservation Area

In the Southern Sierra Fisher Conservation Area, within known or estimated female fisher home ranges outside the Wildland Urban Intermix (WUI), a minimum of 50 percent of the forested area has at least 60 percent canopy cover (SNFPA ROD 2004, p. 41).

Northern Goshawk Protected Activity Centers (PACs)

Stands in each PAC have: (1) at least two tree canopy layers; (2) dominant and co-dominant trees with average diameters of at least 24 inches dbh; (3) at least 60 to 70 percent canopy cover; (4) some very large snags (greater than 45 inches dbh); and (5) snag and down woody material levels that are higher than average (SNFPA ROD 2004, p. 38).

Riparian Conservation Areas (RCAs)

Water quality in Riparian Conservation Areas meets the goals of the Clean Water Act and Safe Drinking Water Act: it is fishable, swimmable, and suitable for drinking after normal treatment. Habitat supports viable populations of native and desired non-native plant, invertebrate, and vertebrate riparian and aquatic-dependent species. New introductions of invasive species are prevented. Where invasive species are adversely affecting the viability of native species, the appropriate State and Federal wildlife agencies have reduced impacts to native populations.

Species composition and structural diversity of plant and animal communities in riparian areas, wetland, and meadows provide desired habitat conditions and ecological functions.

The distribution and health of biotic communities in special aquatic habitats (such as springs, seeps, vernal pools, fens, bogs, and marshes) perpetuates their unique functions and biological diversity.

Spatial and temporal connectivity for riparian and aquatic-dependent species within and between watersheds provides physically, chemically and biologically unobstructed movement for their survival, migration and reproduction.

The connections of floodplains, channels, and water tables distribute flood flows and sustain diverse habitats.

Soils with favorable infiltration characteristics and diverse vegetative cover absorb and filter precipitation and sustain favorable conditions of stream flows.

In stream flows are sufficient to sustain desired conditions of riparian, aquatic, wetland, and meadow habitats and keep sediment as close as possible to those with which aquatic and riparian biota evolved.

The physical structure and condition of stream banks and shorelines minimizes erosion and sustains desired habitat diversity.

The ecological status of meadow vegetation is late seral (50 percent or more of the relative cover of the herbaceous layer is late seral with high similarity to the potential natural community). A diversity of age classes of hardwood shrubs is present and regeneration is occurring.

Meadows are hydrologically functional. Sites of accelerated erosion, such as gullies and headcuts are stabilized or recovering. Vegetation roots occur throughout the available soil profile. Meadows with perennial and intermittent streams have the following characteristics:

(1) Stream energy from high flows is dissipated, reducing erosion and improving water quality,

(2) Streams filter sediment and capture bedload, aiding floodplain development,

(3) Meadow conditions enhance floodwater retention and groundwater recharge; and

(4) Root masses stabilize stream banks against cutting action (SNFPA ROD 2004, p. 43).

California Spotted Owl Protected Activity Centers (PACs)

Within California Spotted Owl PACs stands have: (1) at least two tree canopy layers; (2) dominant and co-dominant trees with average diameters of at least 24 inches dbh; (3) at least 60 to 70 percent canopy cover; (4) some very large snags (greater than 45 inches dbh); and (5) snag and down woody material levels that are higher than average (SNFPA ROD 2004, p. 37).

California Spotted Owl Home Range Core Areas (HRCAs)

California Spotted Owl HRCAs consist of large habitat blocks that have: (1) at least two tree canopy layers; (2) at least 24 inches dbh in dominant and co-dominant trees; (3) a number of very large (greater than 45 inches dbh) old trees; (4) at least 50 to 70 percent canopy cover; and (5) higher than average levels of snags and down woody material (SNFPA ROD 2004, p. 40).

Public Involvement

In accordance with the National Environmental Policy Act (NEPA), public collaboration was sought in the development of the Proposed Action and alternatives through a 30-day scoping period beginning in May 2013 and two 30-day Notice of Intents (NOIs) to prepare an environmental impact statement (EIS). The NOIs were published in the Federal Register on August 12, 2014 and January 30, 2015. A forty-five (45) day public comment period would occur on this draft environmental impact statement (DEIS) prior to issuance of a final EIS (FEIS). The Draft Record of Decision will be subject to a 45 day-objection period when the FEIS is released.

Scoping comments were carefully considered by project specialists. Approximately 28 comment letters on the proposed action were received. The inter-disciplinary team (IDT) identified issues from public responses to scoping and interdisciplinary discussion. Relevant issues and alternatives to the proposed action based on those issues were approved by the Deciding Officer.

Issues

Comments from the public and other agencies were used to formulate issues concerning the proposed action. The Forest Service separated the issues into two groups: significant and non-significant. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the Proposed Action; 2) already decided by law, regulation, Forest Plan or other higher level decision; 3) irrelevant to the decision to be made; 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explains this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" A list of non-significant issues and reasons why they were found non-significant may be found in the project record located at the Western Divide Ranger District Office.

Two significant issues were identified through public (external) and interdisciplinary (internal) scoping and are summarized below. The issue statements are written as a cause and effect relationship and may be from several sources with a similar issue.

- Issue 1: Removing trees larger than 8 inches in diameter may have adverse effects on wildlife and other resources.
  - This issue generated a non-commercial alternative (Alternative 3). This alternative addresses potential adverse impacts on fuels, wildlife, visuals, soils, and watershed resources related to using mechanical equipment to thin trees larger than 8 inches in diameter by limiting thinning to hand thinning of trees less than 8 inches diameter.
  - Indicator: Acres of area treated.
- Issue 2: Proposed activities in Dry Meadow and Tyler Meadow may push the Dry and Tyler drainages over threshold of concern.
  - This issue was addressed by proposing road decommissioning in both action alternatives.
  - Indicator: Changes in the threshold of concern.
  - Indicator: Acres of area treated.

The following non-significant issues were included in the analysis.

1. Increased levels of disturbance within potential roosting habitat or known roost areas identified within the forest plan. Forest thinning, mastication, fuel reduction activities, and temporary road work may utilize mechanical equipment increasing noise levels and human activity (access, movement).

2. Changes in the availability and distribution of roost structures specifically large snags and live trees (≥24 inches diameter). Retaining a series of large roosting structures (large snags or large live trees) across the landscape is important for the condor.

3. Fisher related: Change in California Wildlife Habitat Relationships Habitat. Changes in quality, quantity and distribution of available habitat can affect fisher foraging; reproduction; and movements (daily, breeding-season, and dispersal), altering individual energetics.
   a. Changes in availability of intermediate and large trees for resting and denning structures. The availability of suitable intermediate (11-24”dbh) and large (>24”dbh) trees and snags to serve as resting and denning structures is thought to be a limiting factor across the environment. It is therefore important to ensure that sufficient structures remain across the landscape so that fisher movement and reproduction is not disrupted, which could lead to increased energetic expense or a decrease in reproductive rate.
   b. Habitat connectivity: Habitat adjacent to the Tobias Project area has been severely fragmented and isolated by past large fires and logging activities. Fragmentation of habitat may lead to decreased dispersal ability of fishers and isolation. Dispersal has profound implications to mammalian population structure, affecting the ability to colonize vacant habitat, home range spacing patterns, and local genetics. In small, isolated populations such as the Southern Sierra fisher, fragmentation can lead to extirpation.

c. Effects of wildfire on fisher habitat: It is important to analyze the short-term effects of fuels reduction across a planning area compared to the long-term effects of catastrophic fire in the absence of fuels reduction treatments. The long term consequences of uncharacteristically severe wildfire have the potential to eliminate large contiguous acreages of habitat, further fragmenting this isolated Southern Sierra fisher population.

d. Reducing canopy closure below 40% and removing significant quantities of large live trees and snags as part of a forest ecological restoration project has the potential to degrade suitable CWHR 2.1 fisher habitat.

4. Mountain Yellow-Legged Frog (MYLF) related: Skidding logs and broadcast burning in riparian areas has the potential to degrade MYLF habitat and crush or burn individuals. Reopening temporary roads and log landings in MYLF suitable habitat, streamside management zones (SMZ), and riparian conservation areas (RCA) may degrade habitat.

5. Prescribed burning has the potential to degrade air quality by releasing large amounts of particulate matter and carbon dioxide. The reconstruction of old temporary roads and the construction of new temporary roads has the potential to contribute towards erosion and sedimentation of the waterways.

6. Soils Related: There is a concern for soils on cable yarding landings and areas beneath cables.

   a. There is a concern prescribed fire and tractor piling will reduce soil cover and cause an increase in accelerated erosion that could result in a loss of soil productivity.

   b. There is a concern that prescribed burning and burning of slash piles could damage from soil heating.

CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes the alternatives considered in detail for the Tobias Project. It describes the alternatives considered in detail and those eliminated from detailed study. The end of this chapter presents the alternatives in tabular format so that the alternatives and their environmental impacts can be readily compared.

An alternative to the Proposed Action was developed to address issues that could not otherwise be addressed through design features, specifically a non-commercial thinning alternative. Table 5 displays the extent to which each alternative meets the purpose and need stated in Chapter 1, addresses relevant issues identified from public comment and other criteria that guide the decision-making process.

ALTERNATIVES CONSIDERED IN DETAIL

Based on the issues identified through public comment on the proposed action, the Forest Service developed one alternative proposal that achieves the purpose and need differently than the proposed action. In addition, the Forest Service is required to analyze a No Action alternative. The proposed action, alternative 3, and no action alternative are described below.

ALTERNATIVE 1 - NO ACTION

Under the No Action alternative, current management plans would continue to guide management of the project area. No fuels treatment, tree thinning/removal or ecological restoration activities would be implemented to accomplish the purpose and need.

ALL ACTION ALTERNATIVES

The two action alternatives are the proposed action (Alternative 2) and the non-commercial action (Alternative 3), where both alternatives propose to treat 4,898 acres of the 11,000 acre Tobias Project area, decommission 11.29 miles of road, and implement hazard tree removal along National Forest System (NFS) roads.

1. Road decommissioning would occur on approximately 11.29 miles of NFS roads. This action consists of removing culverts during stream channel reconstruction, installing water-bar/cross drain (100 feet spacing), ripping and mulching, and blocking road entrances. Reconstruction of the stream channel would recreate and stabilize the natural, pre-road stream channel. Ripping and mulching decommissioned roads would accelerate the process of the road returning to its natural state.

Table 1. Proposed Road Decommissioning (Approximate Miles)

Road No.	Road Name	Proposed Activity	Miles
24815A	Portuguese Meadow	Decommission	0.43
24824A	Tobias Meadow	Decommission	0.6
24825A	Sunday Peak	Decommission	0.3
24825B	Sunday Peak	Decommission	0.3
24834A	Tyler Meadow	Decommission	0.42
24835C	Shultz Creek	Decommission	1.4
24837	South Dry Meadow	Decommission	1.1
24837A	South Dry Meadow	Decommission	0.6
24845	Stormy Canyon	Decommission	0.47
24845A	Stormy Canyon	Decommission	0.3
24846A	Deep Creek	Decommission	0.46
24880A	Lower Dry Meadow	Decommission	0.68
24880B	Lower Dry Meadow	Decommission	0.29
24880C	Lower Dry Meadow	Decommission	0.45
24883A	Upper Dry Meadow	Decommission	0.76
24880	Lower Dry Meadow	Convert To Trail	1.37
24883	Upper Dry Meadow	Convert To Trail	1.36
		Total Miles	11.29

2. **Hazard tree removal** would be completed along Forest Service roads in the project area following hazard tree guidelines and may include trees of any size or species.

Design Features Common to Both Action Alternatives

Heritage/Cultural and Native American Interests

Protection of Cultural Resources

Cultural Resources will be protected using a combination of the following design features:

- Avoidance (Regional PA Appendix E; 1.1 (a) and 1.3) means that no activities associated with the undertaking will occur within archaeological site boundaries.
    - Identification of archaeological sites will be facilitated by delineating site boundaries with flagging tape and communicating site locations with project leaders.

- Monitoring (Regional PA Appendix E; 1.5) will be conducted when avoidance is not possible. Monitoring will be conducted by qualified Heritage staff and used to enhance the effectiveness of avoidance.
- The Protocol for Vegetation Management from within Site Boundaries (Regional PA, Appendix E; 2.2 (b)) will be used when avoidance is not possible. The protocol outlines the following procedures:
  - Fire lines or breaks may be constructed off sites to protect at risk historic properties.
  - Fire shelter fabric or other protective materials or equipment (e.g., sprinkler systems) may be utilized to protect at risk historic properties.
  - Vegetation may be removed and fire lines or breaks may be constructed within sites using hand tools, so long as ground disturbance is minimized and features are avoided, as specified by the qualified Heritage Program staff.
  - Fire retardant foam and other wetting agents may be utilized to protect at risk historic properties and in the construction and use of fire lines.
  - Surface fuels (e.g., stumps or partially buried logs) on at risk historic properties may be covered with dirt, fire shelter fabric, foam or other wetting agents, or other protective materials to prevent fire from burning into subsurface components and to reduce the duration of heating underneath or near heavy fuels.
  - Trees that may impact at risk historic properties should they fall on site features and smolder can be directionally felled away from properties prior to ignition, or prevented from burning by wrapping in fire shelter fabric or treating with fire retardant or wetting agents.
  - Vegetation to be burned shall not be piled within the boundaries of historic properties unless locations (e.g., a previously disturbed area) have been specifically approved by qualified Heritage Program staff.
  - Fire crews may monitor sites to provide protection as needed.
- The Protocol for Hazardous Fuels Reduction (Regional PA, Appendix H; 5.2 and 5.3) will also be used when avoidance is not possible. The protocol outlines the following:
  - Fire crews may monitor sites to provide protection as needed.
  - Fire lines or breaks may be constructed off sites to protect at risk historic properties.
  - Vegetation may be removed and fire lines or breaks may be constructed within sites using hand tools, so long as ground disturbance is minimized and features are avoided, as specified by qualified Heritage Program staff.
  - Fire shelter fabric or other protective materials or equipment (e.g., sprinkler systems) may be utilized to protect at risk historic properties.
  - Fire retardant foam and other wetting agents may be utilized to protect at risk historic properties and in the construction and use of fire lines.
  - Surface fuels (e.g., stumps or partially buried logs) on at risk historic properties may be covered with dirt, fire shelter fabric, foam or other wetting agents, or other protective materials to prevent fire from burning into subsurface components and to reduce the duration of heating underneath or near heavy fuels.

  - Trees which may impact at risk historic properties should they fall on site features and smolder can be directionally felled away from properties prior to ignition, or prevented from burning by wrapping in fire shelter fabric or treating with fire retardant or wetting agents.
  - Vegetation to be burned shall not be piled within the boundaries of historic properties unless the location (e.g., a previously disturbed area) has been specifically approved by qualified Heritage Program staff.
  - Mechanically treated (crushed/cut) brush or downed woody material may be removed from historic properties by hand, through the use of off-site equipment, or by rubber-tired equipment approved by qualified Heritage Program staff. Ground disturbance shall be minimized to the extent practicable during such removals.
  - Woody material may be chipped within the boundaries of historic properties so long as the staging of chipping equipment on-site does not affect historic properties.
  - Qualified Heritage Program staff shall approve the use of tracked equipment to remove brush or woody material from within specifically identified areas of site boundaries under prescribed measures designed to prevent or minimize effects. Vegetative or other protective padding may be used in conjunction with qualified Heritage Program staff's authorization of certain equipment types within site boundaries.
- When felling trees and avoidance of archaeological sites is not possible the Protocol for Felling and Removal of Trees (Regional PA Appendix E; 2.1 (b) and 2.2 (a)) will be used. This protocol describes methods for tree felling and removal from within site boundaries. Protocol for removing trees within site boundaries will be used in any area where it is necessary to drop trees. The protocol outlines the following:
  - Under specific conditions trees may be felled over archaeological sites. The cover must be at least 12 inches of compacted snow or ice through the duration of the project and all work areas (e.g., landings, skid trails, turnarounds, and processing equipment sites shall be located prior to snow accumulation and outside historic property boundaries.
  - To prevent soil gouging during felling trees may be limbed or topped.
  - Felled trees may be removed using only the following techniques: hand bucking, including use of chain saws, and hand carrying, rubber tired loader, crane/self-loader, helicopter, or other non-disturbing, qualified Heritage Program staff -approved methods;
  - Equipment operators shall be briefed on the need to reduce ground disturbances (e.g., minimizing turns);
  - No skidding nor tracked equipment shall be allowed within historic property boundaries; and
  - Where monitoring is a condition of approval, its requirements or scheduling procedures should be included in the written approval.
- When a linear site (i.e., historic trail) cannot be avoided the Protocol for Crossing Linear Sites (Regional PA, Appendix E; 2.1 (a) will be used. The guidelines for this protocol are as follows:

- Linear sites (e.g., historic trails, roads, railroad grades, ditches) may be crossed or breached by equipment in areas where their features or characteristics clearly lack historic integrity (i.e., where those portions do not contribute to site eligibility or values).
- Crossings are not to be made at the points of origin, intersection, or terminus of linear site features.
- Crossings are to be made perpendicular to linear site features.
- The number of crossings is to be minimized by project and amongst multiple projects in the same general location.
- The remainder of the linear site is to be avoided, and traffic is to be clearly routed through designated crossings.

Post Project Survey

- Regional PA Appendix H; 3.1 (c), 4.1 (b), and 6.1
- In areas where survey was impossible due to thick brush post project survey will be implemented. Before project actions start qualified heritage personal will design a strategy for this survey.
- The strategy will be based on project operations and areas that have high archaeological sensitivity but did not receive survey due to thick brush.
- The survey would be implemented after initial vegetation thinning and before subsequent burning.

Native American Interests

- Gathering locations will be communicated to project leaders in order to facilitate protection. Protection may include avoidance and/or monitoring.
- Gathering windows (i.e. when resources are ready for gathering) will be communicated to project leaders for protection.
- Where possible, gathering areas, and access to those areas will be improved upon.
- Gathering locations will be kept as confidential as possible.

AQUATIC

General Design Features

- All observations of threatened, endangered, proposed or Forest Service sensitive species during any phase of project work will be reported to the District Wildlife Biologist.
- A Forest Service biologist knowledgeable in the life histories and ecologies of the listed species in the region, will train program for construction personnel. The training will describe the species, the Endangered Species Act, the definition of 'take,' and all design features applicable to their scope of work. The Forest Service biologist will provide a handout of the design features to each crew member during training.

- On an annual basis, prior to commencing treatment activities adjacent to suitable mountain yellow-legged frog habitat, a Forest Service biologist will conduct MYLF surveys for occupancy. Surveyors will also inspect the MYLF habitat to identify potential refugia for the frog.
- All project personnel who may potentially enter meadows, streams or riparian areas during pre-construction, construction; repair or maintenance of the project will follow the Forest Service's decontamination protocol to prevent spread of Batrachochytrium dendrobatidis. A copy of the protocol will be provided to all project personnel during environmental briefing. Decontamination kits will be kept onsite, with a copy of the protocol, for all phases of implementation for this project.

Perennial and Intermittent Streams and meadows:

- No vegetation management activities (i.e. thinning, mastication, pile and burn, or under burn) will occur within 100 feet of any perennial stream or meadow. Outside of the 100 foot buffer, only hand thinning of small trees (<10" dbh) and brush will occur within the next 50 feet (i.e. 100 to 150 foot zone). Generated slash from hand thinning will be piled and burned outside of 100 feet. All piles within 150 ft. of streams or meadows will be lined prior to burning to eliminate fire spread and impacts to adjacent ground cover. All burning operations will occur under prescribed conditions.
- Thinning activity utilizing tractor methods or mastication will be avoided where the predicted, post-logging erosion hazard cannot be reduced to either "low" or "moderate." The careful control of skidding patterns will serve to avoid onsite and downstream channel instability, build-up of destructive runoff flows, and erosion in sensitive watershed areas such as meadows and Streamside Management Zones (per BMP 1.9; per BMP 1.10).
- No skidding or end-lining will occur within 100 feet of perennial or intermittent streams and meadows.
- In RCAs, proposed management activities will increase or decrease frequency and distribution of coarse woody debris (defined as down logs >12" diameter at mid-point) where needed to meet a range of 10 to 20 tons/acre, if possible. Woody debris levels may be averaged over Riparian Conservation Areas within a 10 acre block in order to sustain stream channel physical complexity and stability.
- Low ground pressure equipment, helicopters, over the snow logging, or other non-ground disturbing actions will be implemented when needed to achieve Riparian Conservation Objectives (RCAs) in order to minimize impacts to riparian conservation areas when operating off of existing roads. The measures include minimizing construction of skid trails or roads for access into riparian conservation areas for fuels treatments or hazard tree removal.
- Landings will be located where the fewest number of skid trails will be required, and side cast can be stabilized without entering drainages or affecting other sensitive areas. Landings will be positioned such that the skid trail approach will be as nearly level as possible to promote safety, and protect the soil from erosion. The number of skid trails entering a landing will be kept to a minimum (per BMP 1.12).

- All heavy equipment, vehicles, and construction activities will be confined to existing access roads, road shoulders, and disturbed or designated work areas. Work areas will be limited to what is absolutely necessary for treatment application.
- Equipment, when not in use, will be stored in upland areas outside of the boundaries of waterways/wet meadows.
- When handling and/or storing chemicals (fuel, hydraulic fluid, etc.) necessary for equipment near waterways, applicable BMPs will be followed to prevent spills and contamination; any and all applicable laws and regulations will be followed. Appropriate materials will be stored and accessible on site to prevent and manage spills. Service and refueling procedures will not be conducted where there is potential for fuel spills to seep or wash into waterways.
- On-site fueling will only be used when and where it is impractical to send vehicles and equipment off-site for fueling. When fueling must occur on-site, the Forest Service will designate an area to be used. Drip pans or absorbent pads will be used during on-site vehicle and equipment fueling.
- Dedicated fueling and refueling practices will be designated and will be protected from storm water run-off and will be located at least 50 feet from downslope drainage and water courses. Fueling will be performed on level-grade areas.
- All felled hazard trees within 100ft of suitable mountain yellow-legged frog habitat will be left on site, unless they are felled directly on a road, or can be cut into smaller sizes and removed with grappling arm allowing for no ground disturbance.
- No Herbicides will be used in treatment areas as part of the project action.
- All construction equipment will be well maintained to prevent leaks of fuels, lubricants or other fluids into waters of the United States.
- During project activities, all trash that may attract predators will be properly contained in covered garbage receptacles and removed from the site daily. Following treatment, all debris will be removed from project sites.
- Spill containment kits will be maintained onsite at all times during construction operations and/or staging or fueling of equipment.
- Erosion, sediment and material stockpile BMPs will be implemented per the Erosion Control Plan.
- Within 200 feet of all suitable mountain yellow-legged frog habitat, prior to acceptance of erosion control work done in units, the sale administrator will coordinate with the District Hydrologist or Forest Aquatic Biologist to insure all erosion control standards, including BMP's have been implemented and determined effective.
- Within the project sub-watersheds, soil disturbance from project activities within 100 feet of ephemeral, intermittent, or perennial streams that are greater than 6" deep will be rehabilitated by planting to minimize sediment transport into stream channels.
- All equipment will be free of mud and dirt prior to bringing it within the Sequoia National Forest to prevent the spread of Chytrid fungus.

Road Work (New temporary road construction and reconstruction, and road decommissioning) at designated stream crossing.

- Four temporary stream crossings were identified with new temporary road construction or existing temporary road reconstruction activities. In addition 5 culverts ranging in size from 12 to 18 inches in diameter and 20 feet in length would be removed during road decommissioning work. The following conservation measures would apply:
- Prior to beginning project actions, the area will be surveyed by a Service-approved biologist for the mountain yellow-legged frog. If individuals of the species are detected all work will cease until the individual is moved by the service approved biologist to an appropriate location out of harm's way.
- At the end of the day, any steep-sided excavations more than one foot deep will be provided with one or more ramps installed at an angle of no more than 45 degrees to allow egress of trapped animals. Ramps shall be constructed of earth material or plywood (or similar material), and be a minimum of six inches in width.
- A Service-approved biologist will inspect excavations prior to backfill or grading to ensure that no listed species are trapped within.
- All open ends of culvert pipes stored on site for future placement will be covered at the end of the day. If this is not possible, all ends of pipes will be elevated to a minimum of three feet above the ground.
- Plastic mono-filament netting (erosion control matting) or similar material will not be used at the project site. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds.
- All road construction or reconstruction, culvert placement or removal and road decommissioning will cease for 24 hours following a rain event accumulating 0.1 inches or greater.
- All road decommissioning construction will only occur from August 1st to October 31st.
- No turning of equipment will occur off road bed in MYLF suitable habitat to minimize soil disturbance in watershed.
- There will be two drafting sites available, 1) the tank on road 23S16 and 2) the Scarlett and Davis draft site. If another site is needed, it must be approved by a hydrologist or biologist. Drafting intakes will be completely screened with wire mesh no larger than 0.2 inch.
- Use only water for dust abatement within 165 feet of streams and hydrologically connected tributaries or meadows. If water diversion is necessary for any project related activities, no de-watering of suitable stream habitats will occur during implementation, even if temporarily
- No de-watering of the channel outside of the approved crossing area previously designated will occur downstream of the crossing, even temporarily. A Service-approved aquatic biologist will be present during stream crossing structure removal, (i.e. culverts), or their placement, during project activities. If stream channel is not flowing but pools are present, the Service-approved biologist will survey the area for the frog on a daily basis prior to starting any project work

- If necessary, only low velocity water pumps will be used for diversion around project area to downstream location, intakes will be completely screened with wire mesh no larger than 0.2-inch to prevent frogs from entering the pump. Any sensitive species discovered during dewatering should be relocated to a safe place upstream or downstream in similar habitat. Any listed species encountered should be reported to the Service within one working day.

Prescribed Fire

- When conducting surveys of intermittent streams prior to activities, surveyors will mark permanent plunge pools where located, and establish a 100 foot buffer from the pools. Plunge pools will be treated like perennial streams with no action activities occurring within 100 feet of the pools. Outside of the 100 foot buffer from the pools, only hand thinning of small trees (<10” dbh) and brush and pile burning, will occur within the next 50 feet (i.e. 100 to 150 foot zone). Generated slash from hand thinning will be piled and burned. Piles (100 to 150 foot zone) will be lined to eliminate fire spread and disturbance to adjacent ground cover and burned under prescribed conditions. Within intermittent streams located away from permanent plunge pools, pile burn activities may occur outside of the 100 foot buffer.
- Backing fire from piles may be allowed to enter the 100 foot zone where the intermittent channel is dry and outside of any plunge pool buffer area. The amount of backing fire allowed along any dry intermittent stream reaches will be prioritized by the hydrologist or aquatic biologist.
- A limited operating period from February 1st to August 15th will restrict backing fire from occurring within 100 feet of perennial streams, permanent plunge pools in intermittent streams, or meadows identified as MYLF suitable habitat to protect potential dispersing adults, breeding areas, egg masses and tadpoles in stream /meadow habitats.
- Outside of the limited operating period, late season pile burning will be conducted under prescribed conditions (i.e. generally after the first rain of the season) from 100 to 150 feet away from stream or meadow identified as MYLF habitat. This will limit excessive opportunity for fire spread and will generally produce a lower intensity burn. Where sufficient fuel continuity is present light intensity backing fire from outside of the 150 foot zone will be allowed to enter the 150 foot zone to benefit riparian habitat. Backing fire will not exceed 10% of any perennial stream reach, and only 1 percent of the area within 100 feet of stream or meadow. Burn piles will be placed away from old stumps and snags that could serve as refugia for amphibians, to the extent feasible. In addition, piles will be ignited using firing patterns that increase the probability for small mammals or amphibians to escape the fire (i.e. light one side of the pile not the entire pile perimeter).

BOTANY/NOXIOUS WEEDS

- Any noxious weed occurrences found during project layout and implementation would be reported to the Forest botanist.
- All equipment will be washed and inspected for noxious weeds prior to arrival at project area.
- Avoid any known infestations during project implementation.

HYDROLOGY

The following describes the activities proposed in the streamside management zones (SMZ), riparian conservation areas (RCA), and areas outside the SMZ's and RCA's.

Prescriptions for Streamside Management Zones, Riparian Conservation Areas (RCAs), and Special Aquatic Features:

Water Source Development and Utilization

- Water sources used in the Tobias Project area will come from flowing streams. Water drafted would not be more than 50% of the stream flow present at that time. For example, if a creek had a flow of 2 CFS, then the drafting rate could not be any more than 1 CFS.

Stream Crossings

- The Tobias Project would apply BMP 2.8 stream crossings to the mechanical restoration thinning management areas.

Parking and Staging Areas

- Implement BMP 2.10 where constructing, installing, and maintaining an appropriate level of drainage and runoff treatments for parking and staging areas in order to protect water, aquatic, and riparian resources.
- Staging areas would be associated with mechanical treatment areas (Restoration Thinning and Fuels Treatment) and road maintenance.

WILDLIFE

LIMITED OPERATING PERIODS FOR THE PROTECTION OF WILDLIFE

California spotted owl

- Maintain a limited operating period (LOP), prohibiting vegetation treatment within approximately ¼ mile of the activity center during the breeding season (March 1 through August 15), unless surveys confirm that California spotted owls are not nesting.
- Prior to implementing activities within or adjacent to a California spotted owl PAC and the location of the nest site or activity center is uncertain, conduct surveys to establish or confirm the location of the nest or activity center (SNFPA ROD, p. 60, S&G #75).

Northern goshawk

- Presently there are no goshawk Protected Activity Centers within the Tobias Compartment, and no goshawks were detected through survey.
- Should a goshawk nest be detected through any phase of the project, delineate a PAC and implement a limited operating period (LOP) prohibiting vegetation treatments within approximately ¼ mile of the nest site during the breeding season (February 15 through September 15) (SNFPA ROD, p. 60, S&G #76).

Marten

- To protect unknown maternity den sites from disturbance during vegetation treatments in areas of suitable habitat during the reproductive season, implement a LOP from May 1 through July 31 (SNFPA ROD, p. 62, S&G #88).

California condor:

- Monitoring of the condor satellite tracking website for condor activity will be conducted during harvest and fuel reduction activities.
- Should condor activity suggest use of an active roost site in the project area a limiting operating period restricting activities within 1/2 mile radius of the roost site. The duration extent needed for the LOP will be determined in consultation with the Service, Condor Recovery Team, and the District Biologist.

Protection of Bat Roosting Habitat: To retain habitat quality of the Deep Creek Cave for bat species, retain all vegetation within a 500 foot linear distance of the cave opening.

Fuels Treatments (hand thin, pile and burn and under burn) in the California Spotted Owl PAC:

- Fuel treatments will be allowed in the Tobias PAC because prescribed fire alone would reduce habitat quality and avoiding the PAC would significantly compromise the overall effectiveness of the landscape fire and fuels strategy (SNFPA ROD, p. 60, S&G 72).
- Hand treatments will be done to maintain habitat structure and function of the PAC (SNFPA ROD, p. 60, S&G 72).
- Where treatment is necessary, remove only material needed to meet project fuels objectives. Focus removal on surface and ladder fuels.
- Within mature forest habitat (CWHR types 4M, 4D, 5M, and 5D) remove only the material needed to meet project fuels objectives by removing surface and ladder fuels.
- Prior to any fuel reduction activity, the owl pair will be located to determine current year status.
- Any burn operations such as pile and burn or under burning will be conducted in late fall using prescribed fire methods to minimize torching.
- Burning operations will not result in significant loss of medium or large live trees that would result in alterations to existing canopy cover, where it currently exceeds 50%.
    - However, small scattered pockets of mortality ¼ acre or less are acceptable.
- Hand thinning and fuels treatments within a 500-foot radius of the current year's roost or nest sites are prohibited (SNFPA ROD, p. 60, S&G 73).
- Hand thinning and underburn entries may fell small trees < 10" dbh outside of nest/roost 500-foot perimeter.

- Prescribe burning is allowed within the 500-foot radius buffer. Hand treatments, including handline construction, tree pruning, and cutting of small trees (less than 6 inches dbh), may be conducted prior to burning as needed to protect important elements of owl habitat. Treatments in the remainder of the PAC will follow forest-wide standards and guidelines for mechanical thinning (SNFPA ROD, p. 60, S&G 73).
- Lower lateral branches on larger live trees may be limbed up to reduce the ladder fuel continuum from ground fuels to the overhead canopy.
- Thinning of small trees will be done to promote heterogeneity in species composition, and retain scattered brush complexes over 25% of the treated area.
- Favor retention of brush complexes with evidence of wood rat nests.

Fisher

- A limited operation period for use of heavy equipment and burning will occur between March 1st and June 30th to avoid disturbing potentially denning fishers within suitable habitat The only action that will occur at this time is hand treatment.
- A Forest Service biologist knowledgeable in the life histories and ecologies of the fisher in the region will train marking crews and construction personnel.
- The training will describe the species, and information on the type of defect trees (both live trees and dead trees) utilized by the fisher.
- A handout of the conservation measures will be provided to each crew member during training.
- When treatment areas occur within Core Area 2 identified in the Fisher Conservation Strategy, the Forest Service will maintain 15-20% of each treatment unit as untreated in patches ranging in size from 0.5-5 acres that mimic natural fire patterns to provide habitat heterogeneity for the fisher.
- The creation of “hard edges” between the planted and thinned areas will be avoided, as fishers appear to prefer “feathered” edges for predator avoidance, movement, and for the enhancement of prey habitat.
- Where site conditions permit, the Forest Service will enhance or increase tree canopy cover particularly in drainages, more mesic north-facing slopes, and riparian corridors.
- When feasible, based on the potential of a site to support vegetation, the Forest Service will retain and promote shrub cover clumps, downed logs and standing trees, with singly or in small groups, for the fisher within open areas and near or in canyon bottoms and mesic slopes.
- Forest Service will enhance and retain a patchy mosaic of shrubs and understory vegetation separated by more open areas to reduce fuels continuity, increase habitat heterogeneity, support fisher prey, and provide fishers with hiding cover with a target 10%-20% at the home range scale.
- No rodenticides will be used within the proposed action area.
- All disturbed areas, paths and hard edges created during treatment of habitat will be mediated by replacement of duff, retaining largest trees, and maintaining some felled trees and creating disperse brush piles to feather edges and remove open corridors that could attract use by predators of the fisher.

OTHER SPECIFIC HABITAT GUIDELINES

Oak Development: When planning prescribed fire or mechanical treatments, follow practices to control noxious weed spread. Retain the mix of mast-producing species where they exist within a stand. Manage for a diversity of hardwood tree size classes to allow recruitment through time. In mature forest stands, where conifers are encroaching oaks greater than 4” dbh, thin shade tolerant species from around oaks not already suppressed by trees 30 inches dbh or greater. In early seral stands resulting from the Stormy Fire, thin brush from around black oaks. Also, thin oak sprout clumps to 2 - 4 dominant stems to allow for better growth and development and to stimulate natural regeneration. (SNFPA ROD, p. 53, S&G’s 18-23).

RETENTION STANDARDS FOR LARGE WOODY DEBRIS AND SNAGS

Course Large Woody Debris Retention:

- Retain 10-20 tons/acre of large woody debris in treatment areas throughout the project area with preference for decay classes 1, 2, and 3.
- If large woody debris is lacking, work to retain any felled cull or hazard trees, or damaged or dead trees created through logging or fire operations in excess of snag guideline needs.
- Down logs greater than 12 inches in diameter at mid-point should be used to meet this standard. Focus will be placed on leaving the largest material available.
- When conducting prescribed fire treatments, use firing patterns, fire lines, and other techniques to minimize effects to existing large down woody debris. (SNFPA ROD, p. 51, S&G 10).

Snag Levels:

- Within Sierra mixed-conifer, montane hardwood conifer, white fir, and ponderosa pine types, retain a minimum of 4 snags per acre (largest available), insure at least 2 of the 4 snags will be 24” dbh or greater.
- No snags less than 15” dbh will be considered to meet this standard.
- Within red fir habitats retain 6 snags per acre (largest available, at least 2 snags retained will be $\geq$ 24” dbh).
- Snags numbers can be averaged over a 10 acre block and incorporate mortality pockets. Should there be less than 4 snags/acre, or 40 snags within a 10-acre block, retain some mid- and large diameter live trees that are currently in decline, have substantial wood defect, or that have desirable characteristics such as teakettle branches, large diameter broken top, and large cavities in the tree bole, to serve as future replacement snags and to provide nesting structure.
- Trees showing signs of mortality from drought-related effects can also be considered for leave trees. When determining snag retention levels and locations, consider land allocation, desired condition, landscape position, potential prescribed burning and fire suppression line locations, and site conditions (such as riparian areas and ridge tops), avoiding uniformity across large areas. (GTR 220 and SNFPA ROD, p. 51, S&G 11).

VEGETATION TREATMENT

- Select cut and leave trees, giving shade intolerant pines and oaks a two size class. That means cut a fir or cedar tree that is 20 feet taller or 4 inches greater in diameter to leave a pine or oak.
- Refueling, fuel and other petroleum products used for harvest and vegetation treatment operations would be stored, at least 100 feet from any stream or other sensitive waterbodies.
- All off-road equipment would be cleaned (pressure washed) and inspected prior to entry into the project area to prevent introduction of noxious weed seeds to disturbed areas.
- Imported road surface material, soil, rock, mulch or other foreign material used in any part of the project shall originate from a weed-free source.
- All seeding would be done with Forest-approved certified weed-free seed mix.
- Trails, survey monuments and other improvements would be protected or rehabilitated after operations in the area are complete.
- Operators would be required to set up warning signs advising of equipment operations or hazards for public safety.
- Traffic controls and cautionary signing would be implemented during operations and log hauling as specified under contract provisions.

SOILS

- Maintain a 100 foot wide buffer of 90% soil cover below rock outcrops that have the potential to generate runoff into management activity areas and cause erosion, especially in stands 6, 8, 10, 13, 15-17, 20-25, 27, 29-31, 33-38 and 40. (FSM 2500 – Watershed and Air Management, Chapter 2550 – Soil Management).
- Conduct mechanical equipment operations (mechanical thinning and biomass removal equipment, log skidders and tractor-piling operations) when the soil is sufficiently dry in the top 12 inches to prevent unacceptable loss of soil porosity (soil compaction) or soil disturbance. "Maintain 90% of the soil porosity over 85% of an activity area (stand) found under natural conditions." (FSM 2500 – Watershed and Air Management, Chapter 2550 – Soil Management)
- Limit mechanical operations, where sustained slopes exceed 35%, except where supported by on-the-ground interdisciplinary team evaluation.
- Maintain 50% soil cover over all treatment areas on slopes less than 35% and 60% on slopes greater than 35%. Where shrub species predominate, attempt crushing before piling to create small woody fragments left scattered over the site for soil cover and erosion protection. This design measure is a form of erosion control and adheres to Best Management Practices 1.13 and 1.14. Erosion-control work required by the contract will be kept current. At certain times of the year this means daily, if precipitation is likely, or at least weekly when precipitation is predicted for the weekend.
- Maintain at least five well-distributed logs per acre as large woody debris (LWD). LWD should be at least 12 inches in diameter and 10 feet long or in the largest size classes

representing the range of decomposition classes (1,2,3) as defined in the (SNFPA ROD S&G 10).

Alternative 2 - Proposed Action

Alternative 2 proposes to commercially thin approximately 1,117 acres and to implement non-commercial treatments on approximately 3,781 acres, within the 11,000 acres project area. The proposed action would thin forest stands in the project area to restore a healthy, diverse, fire-resistant forest structure. Vegetation treatments would reduce tree density, reduce fuel loads, and modify species composition (see Table 1). Treatments to promote forest resilience, promote wildlife habitat, and reduce fire severity will be based on the best available science, such as the general technical report (GTR-220), *An Ecosystem Management Strategy for Sierran Mixed Conifer Forests* (North et al. 2000), and its 2012 companion (GTR-237), *Managing Sierra Nevada Forests* (North et al. 2012), available at: http://www.fs.fed.us/psw/publications/gtrs.shtml.

1. **Commercial (Mechanical) thinning** treatment prescriptions would selectively remove overcrowded trees measuring between 10 to 29.9 inches in diameter at breast height (dbh) in mixed-conifer and plantation stands, while favoring fire-resistant oak and pine. Merchantable trees would be removed with mechanized ground-based equipment and skyline yarders on approximately 1,117 acres. This treatment is proposed on 720 acres using ground-based tractor methods in Stands 13, 16, 21-25, 29-31, 33, 34, 36, and 38; and 397 acres using skyline methods in Stands 13, 16, 21-25, and 29-31 and 33. Tree selected to be felled would be designated by marking with Forest Service marking paint. Hand and machine felled trees would be limbed and bucked at the stump. In addition, follow up hand felling of small suppressed, diseased or damaged trees may be done to break up fuel ladders. These trees would be less than ten inches dbh, any pruned limbs and other slash would be treated on site by piling and burning. Approximately forty-seven (47) existing landings and seven (7) hot deck areas have been identified for the proposed action. The number of landings actually needed could be less, and locations could differ from the identified locations, depending on operator needs. Existing landing areas average ¼ acre or less. Hot decks are areas along the road where logs are piled and loaded onto trucks, during the skidding operation to minimize the area needed for decking. Identified hot deck landing sites are not the conventional ¼ acre landing area.
2. **Hand Thinning** is proposed on approximately 1,239 acres in Stands 2-4, 8-17, 19-25, 27, 29-34, 36-38 and 40, due to slopes exceeding 35 percent. Hand thinning is the manipulation of vegetation with tools that can generally be carried and used by one person. The types of tools used to implement hand thinning are chainsaws, handsaws, axes, loppers and chippers. Small trees and brush up to 10" in diameter are cut, piled and burned. Some piles can be left behind for wildlife habitat.
3. **Mastication** would remove 10-inch in diameter and less trees and brush by grinding it with a tractor mounted masticator on slopes up to 35 percent. The masticated vegetation would be left on the ground. Where terrain is rough and rocky ground, hand thinning would be implemented to meet the purpose and need of the project. This treatment is proposed on 2,158 acres in Stands 2, 4, 6, 8-17, 19-22, 25-38 and 40.
4. **Understory Prescribed Burn** is proposed in over mature stands within portions of the California spotted owl protected activity centers (PAC) and home range core areas (HRCA), if deemed needed, after implementing hand thinning treatments. This treatment would be a second entry using prescribed burn methods for implementation approximately 3-5 years after the completion of

the hand thinning and pile burning, to improve resiliency of wildlife habitat and legacy elements. This treatment is proposed on approximately 384 acres in Stands 9, 13, 25, 27 and 30.

5. **Fuels treatment including prescribed burning** may include the removal of brush and three- to 10-inch trees by mechanical or hand thinning to increase forest stand heterogeneity and reduce fuel loading. Thinning can help release naturally-regenerated or planted pine, fir, and oak trees. This treatment would consider all fuels removal options, such as pile burning, lop and scatter, chipping, mastication, and firewood and biomass removal. Prescribed burning would occur over the majority of the project area when weather and fuel conditions are appropriate to meet the fuel load reduction objectives. Fire managers would select areas to burn to optimize smoke dispersion and minimize local exposure to smoke. Burning would be accomplished over a period of 10 years, with the goal of re-introducing fire to the project area. Prescribed burning would be planned adjacent to other treatments to maximize the effectiveness of fuels reduction and help restore a vegetation mosaic of age classes, tree sizes, and species composition.

Table 2. Alternative 2 – Proposed Action Vegetation Treatments

Type of Stands	Approximate Treatment Acres	Proposed Vegetation Treatments	Product Removal
Mid to Late-Successional Forest Stands – 40 to 150 years old overstory	Tractor (720)	Commercial (selective) thinning trees measuring between 10 – 30 inches dbh	2,200 MBF or 4,400 ccf
	Skyline (397)		1,800 MBF or 3,600 ccf
Early successional stands – 0 to 40 years old overstory	Hand (1,239)	Hand felling, mastication and pile/burning of 3-10" trees and brush to break up ladder fuels	1,000 ccf of poles and firewood
	Mastication (2,158)		
Over mature stands – over 150 years old overstory	Underburn (384)	2nd entry Rx burns for stands within California spotted owl PACs and HRCAs	No product removed
Total Treatment	4,898		4,000 MBF or 9,000 ccf

6. Approximately 5.51 miles of **temporary roads** would be necessary to implement the commercial thinning treatments. New temporary road construction consists of approximately 3.73 miles and requires clearing vegetation, road excavation and blading, and installing drainage features. Reconstruction of closed existing temporary roads is 1.78 miles and requires removing entrance barriers, clearing vegetation, road blading, and reconditioning drainage features. All temporary roads would be decommissioned and restored after implementation is completed.

Table 3. Temporary Road Construction

Existing Road	Miles	Existing Road	Miles
Temp Road 1	0.06	Temp Road 3	0.18
Temp Road 2	0.1	Temp Road 5	0.06
Temp Road 4	0.79	Temp Road 8	0.1
Temp Road 6	0.46		
Temp Road 7	0.03	**Total Reconstruction**	**1.78**
New Road	**Mile**	**New Road**	**Miles**
Temp Road 1	0.93	Temp Road 2	0.34
Temp Road 3	0.64	Temp Road 5	0.56
Temp Road 6	0.64	Temp Road 7	0.62
Total New Temporary Road Construction		**3.73 Miles**	

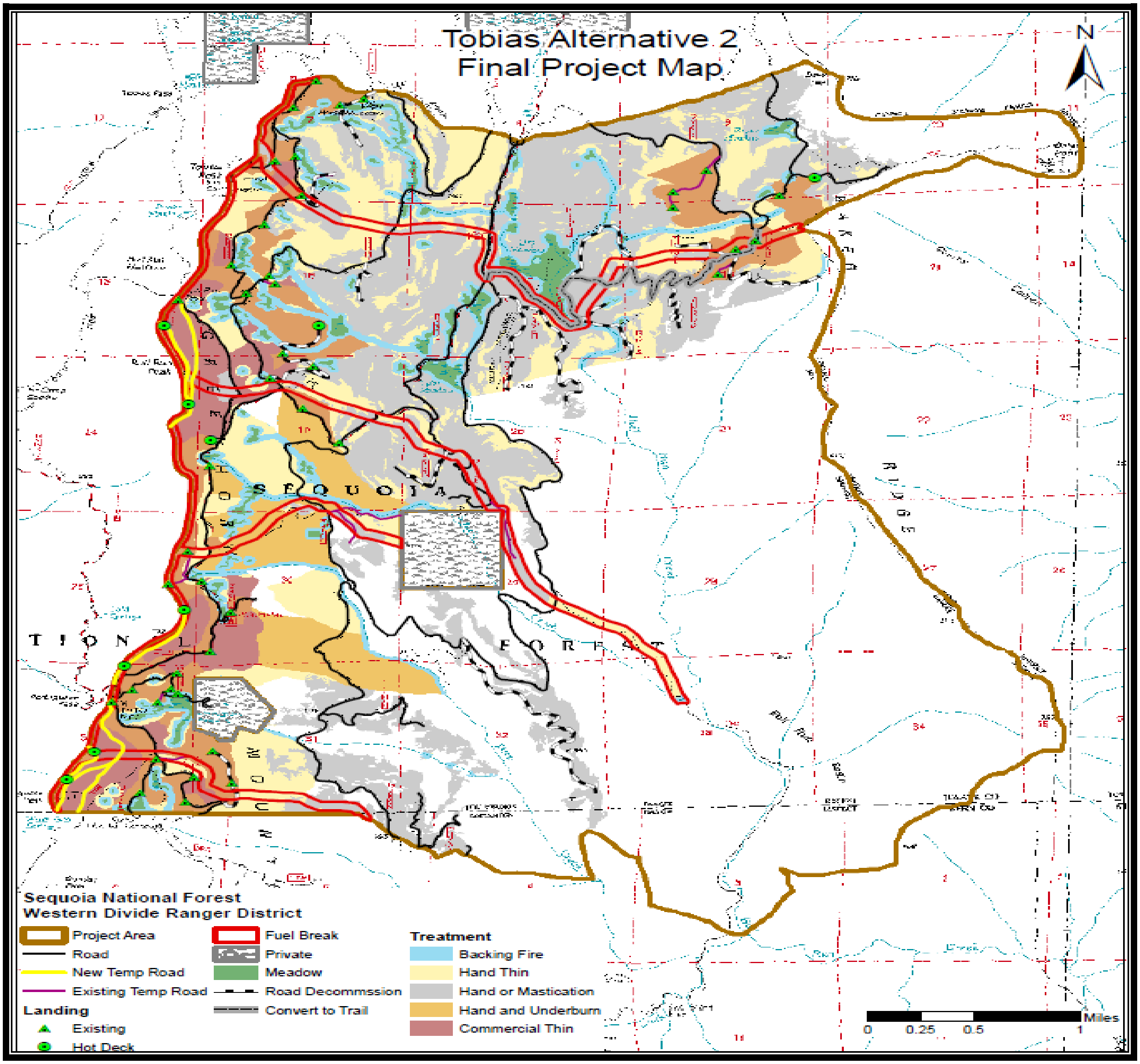


Figure 2. Alternative 2 Map of Proposed Activities

Design Features Specific to Alternative 2

Project design features are incorporated into the project proposed actions described in the EIS. Design features are intended to reduce, minimize, or eliminate impacts to various natural and human resources. These features are intended to assure project compliance with resource protection standards and guidelines in the Sequoia National Forest LRMP, as well as compliance with other Federal and California State laws, regulations, and policy.

HARVEST AND VEGETATION TREATMENT

- Designate skidding patterns to best fit the terrain. Equipment (except feller-bunchers and harvesters) would be kept to the designated skid trails unless negotiated by the timber sale administrator and contractor.
- Ground-based equipment would be restricted to 45% or less slopes to minimize soil disturbance and subsequent erosion. There could be small area inclusions, less than 200 feet slope distance, up to 50% slope in some ground based operation units, per biologist recommendations.
- Ground-based skidding equipment would be restricted to designated trails spaced about 100 feet apart except where converging at junctions or at landings. Area disturbed would be limited to no more than 15 percent of the harvest area.
- Designate skidding patterns to best fit the terrain. Equipment (except feller-bunchers and harvesters) would be kept to the designated skid trails unless negotiated by the TSA and contractor.
- Use old existing skid trails to the extent possible to reduce new soil and vegetation disturbance.
- Disturbed areas on skid trails would be reclaimed, including re-contoured or drainage restored where needed, ripped or scarified where soils would be compacted, and seeded after operations are complete.
- Skid trails would be restored and closed to off-road motorized travel with earth barriers, large trees, cull logs or rocks after operations are complete.
- Skid trails would be located on ridge tops, flat benches, or on existing skid trails where feasible to minimize soil disturbance.
- Locate log landings at old existing landing sites when feasible.
- New or reconstructed landings would be shaped to disperse runoff. Erosion prevention measures such as cross ditches, rock armoring, straw bales, or slash would be used as necessary to direct water to suitable drainage areas and capture sediment.
- Landing slash would be disposed and landings would be ripped or scarified where soils are compacted, cross-drained or re-contoured, and seeded after operations are complete.
- Normal harvest and haul operations would occur from May 15 to October 15 or when conditions allow.
- Dust abatement would be required on roads used for timber hauling as specified under timber sale contract provisions.

SOILS

- Maintain a 100 foot wide buffer of 90% soil cover below rock outcrops that have the potential to generate runoff into management activity areas and cause erosion, especially in stands 6, 8, 10, 13, 15-17, 20-25, 27, 29-31, 33-38 and 40. (FSM 2500 – Watershed and Air Management, Chapter 2550 – Soil Management).

- Conduct mechanical equipment operations (mechanical thinning and biomass removal equipment, log skidders and tractor-piling operations) when the soil is sufficiently dry in the top 12 inches to prevent unacceptable loss of soil porosity (soil compaction) or soil disturbance. “Maintain 90% of the soil porosity over 85% of an activity area (stand) found under natural conditions.” (FSM 2500 – Watershed and Air Management, Chapter 2550 – Soil Management)
- Subsoil and water bar skid roads and trails in areas where soil compaction exceeds 15% of a treatment area. (FSM 2500 – Watershed and Air Management, Chapter 2550 – Soil Management)
- Limit mechanical operations, where sustained slopes exceed 35%, except where supported by on-the-ground interdisciplinary team evaluation.
- Maintain 50% soil cover over all treatment areas on slopes less than 35% and 60% on slopes greater than 35%. Where shrub species predominate, attempt crushing before piling to create small woody fragments left scattered over the site for soil cover and erosion protection. This design measure is a form of erosion control and adheres to Best Management Practices 1.13 and 1.14. Erosion-control work required by the contract will be kept current. At certain times of the year this means daily, if precipitation is likely, or at least weekly when precipitation is predicted for the weekend.
- Maintain at least five well-distributed logs per acre as large woody debris (LWD). LWD should be at least 12 inches in diameter and 10 feet long or in the largest size classes representing the range of decomposition classes (1,2,3) as defined in the (SNFPA ROD S&G 10).
- Limit tractor piling on slopes >25% and use a grapple piler.
- Soil disturbance from cable yarding that is greater than or equal to 10 feet long and six inches deep in top soil (as opposed to litter or duff) would be rehabilitated to replace soil and provide a minimum of 60% ground cover.

GEOLOGY AND SLOPES

BMP 2.2 - General Guidelines for the Location and Design of Roads

- Consider potential for generation of waste material in location of roads, and need for access to appropriate disposal areas. Waste or spoil may not be placed within SMZs, on slopes greater than 60 percent, on unstable slopes, or in areas subject to converging runoff.
- Design roads to balance cuts and fills or use full bench construction where stable fill construction is not possible.

BMP 2.3 - Road Construction and Reconstruction

- Implement the approved erosion control plan that covers all disturbed areas, including borrow areas and stockpiles used during road management activities (see BMP 2.13- Erosion Control Plan). Include the forest’s wet weather operations standards (WWOS).
- Maintain erosion-control measures to function effectively throughout the project area during road construction and reconstruction, and in accordance with the approved erosion control plan (see BMP 2.13- Erosion Control Plan).

- Limit operation of equipment when ground conditions could result in excessive rutting, soil compaction (except on the road prism or other surface to be compacted), or runoff of sediments directly to streams.
- On slopes greater than 40 percent, the organic layer of the soil shall be removed prior to fill placement, according to project specifications.
- Construct fills and keyways according to design drawings and specifications, not exceeding specified lift thickness and moisture content. Ensure un-compacted materials are prevented from leaving disturbance limits.
- Stabilize all disturbed areas with mulch, erosion fabric, vegetation, rock, large organic materials, engineered structures, or other stabilization measures according to the Erosion Control Plan, and project specifications and drawings for permanent controls (that is, crib walls, gabions, riprap placement, and so forth).
- Install erosion-control measures on incomplete roads prior to precipitation events or the start of the winter period (November 16 through March 31) and in accordance with the approved erosion control plan
- When pioneer roads are necessary:
    - Confine construction of pioneer roads to the planned roadway limits unless otherwise specified or approved.
    - Locate and construct pioneering roads to prevent undercutting of the designated final cut slope.
    - Avoid deposition of materials outside the designated roadway limits.

WILDLIFE

The Forest Service proposes to avoid and minimize effects to the California condor, the mountain yellow-legged frog, and the fisher by implementing the following measures:

Common to all Species:

- If a harvest landing is on a permanent road, any cull decks on the landing should be broken down before the end of the season.
    - This will help ensure that logs decks do not become suitable refugia (resting sites) for fisher.
- If a harvest landing is on a temporary road, it can be left indefinitely or broken down before the end of the season.
- Decks will not be worked on between March 1 and June 30.
- Thinning activity utilizing Tractor methods will be avoided where the predicted, post-logging erosion hazard cannot be reduced to either "low" or "moderate."
    - The careful control of skidding patterns will serve to avoid onsite and downstream channel instability, build-up of destructive runoff flows, and erosion in sensitive watershed areas such as meadows and Streamside Management Zones (per BMP 1.9; per BMP 1.10).

Mountain Yellow-Legged Frog

- No skidding or end lining will occur within 100 feet of suitable mountain yellow-legged frog habitat, including both streams and meadows.

- Landings will be located where the least amount of skid roads will be required, and side cast can be stabilized without entering drainages or affecting other sensitive areas.
- Landings will be positioned such that the skid road approach will be as nearly level as possible to promote safety, and protect the soil from erosion.
- The number of skid trails entering a landing will be kept to a minimum (per BMP 1.12).

Road Work

The design features for "road work" are referring to new temporary road construction and reconstruction, road decommissioning, and dust abatement at designated stream crossing. Four temporary stream crossings were identified with new temporary road construction or reconstruction activities. In addition, 5 culverts ranging in size from 12 to 18 inches in diameter and 20 feet in length, would be removed for road decommissioning work.

- There will be two drafting sites available, 1) the tank on road 23S16 and 2) the Scarlett and Davis draft site.
    - If another site is needed, it must be approved by the hydrologist.
- Drafting intakes will be completely screened with wire mesh no larger than 0.2 inch.
- Tractor logging will be avoided where the predicted, post-logging erosion hazard cannot be reduced to either "low" or "moderate."

Fisher

- Trees ≥24" dbh marked for harvest in the following stands (16, 21, 22, 23, 24, 25, 27, 30, 31, 33, 34, 36, and 38) would be free of cavities, witches brooms, debris platform, splits and crack, and broken tops. Trees with the above defect features, needing to be felled due to public safety concerns, will be felled and left on site.
- Marking crew will inspect suitable fisher habitat (Davis 2.4) to retain downed wood, snags and large live trees with defects to provide for future refugia site.
    - These trees will be marked for retention.
- Ten to twenty tons of downed woody debris (logs or snags 12 inches in diameter or greater) per acre will be retained or created during thinning activities to provide resting and denning habitat to the fisher.
- At least 4 (of the largest possible) snags will be maintained per acre treated, and at least two of these snags will be 24 inches in diameter or greater.
- Snags on slopes exceeding 35 percent that do not pose a roadside hazard would be left to retain habitat for wildlife.
- Snag retention needs would be evaluated and averaged for each 10 acres of treated.
- Canopy cover will not be reduced more than an average of 30% in any treatment area.
- The trees with largest basal area will be retained, and the treatment area will retain at least 40% of the basal area prior to treatment.
- Treatment of units would begin with skyline treatments working from the most southerly stands (21, 22, 23, 24 and 25) to the northernmost stands (29, 31, and 33).
- All skyline units will be completed in one year, if practicable, and this treatment type will not occur over a duration of more than 2 years.
- Tractor methods in units contain suitable fisher habitat (CHWR 2.1) will begin following skyline methods beginning in the first year, however treatment units will be partitioned into treatment areas scheduled to minimize prolonged disturbance to the fisher.

- The tractor area treatments will occur in the following order, first treatment of the southernmost area in years one and two (Stands 21, 22, and 23), to be followed by treatment area 2 (Stands 29 and 31) in years 2 and 3, then treatment area 3 (Stands 24 and 25) in years 3 and 4 and treatment area 4 (Stands 16, 33, and 34) to proceed last, in years 4 and 5.
- Total treatment by tractor method annually should not exceed 175 acres (~10% of suitable habitat in the project area).
- Should treatment plans deviate the Forest Service should contact the Service immediately.

AQUATIC

General

- Management activities affecting tree canopy cover within the 300 feet RCAs should not increase water temperatures above thresholds necessary for local aquatic- and riparian-dependent species assemblages (21 degrees Celsius for rainbow trout assemblages). Install thermograph devices to monitor stream temperature.
- No skidding or end-lining, skid trails, temporary roads (new/old), or landings Within 200 feet of all perennial streams (suitable stream MYLF habitat).
- Prior to acceptance of erosion control work done in units, the sale administrator will coordinate with the District hydrologist or Forest aquatic biologist to insure all erosion control standards, including BMP's have been implemented and determined effective.

Meadows

- No end-lining within 100 feet of MYLF unknown occupancy meadows (BMP 1.21).
- No end-lining across meadow habitat.
- No skidding within 100 feet of meadows.

Streams

- No end-lining within 100 feet of MYLF unknown occupancy meadows unless area was appropriately surveyed and approved by the Forest aquatic biologist.
- No end-lining within or across any riparian vegetation of perennial or intermittent channels.

Mechanical Thinning Treatments:

- For all mechanical thinning treatments, no live trees 30 inches dbh or larger will be removed except where needed for equipment operability SNFPA ROD, p. 50, S&G 6.

For mechanical treatments in mature forest habitat (CWHR types 4M, 4D, 5M, 5D, and 6) outside the WUI defense zones the following will apply (SNFPA ROD, p. 50, S&G 7):

- Silvicultural prescriptions will retain at least 40% of the existing basal area comprising the largest trees.
- Where available, design projects to retain 5 percent or more of the total treatment area in lower layers composed of trees 6 to 24 inches dbh within the treatment unit.
- Avoid reducing pre-existing canopy cover by more than 30% within the treatment unit. Percent is measured in absolute terms (for example, canopy cover at 80 percent will not be reduced below 50 percent).

- Silvicultural prescriptions will maintain canopy cover of at least moderate suitability (50 percent or greater preferred), immediately post treatment where this amount of cover exceeded these levels or currently existed. Where this cannot be done and accomplish effective fuels treatment and must be reduced below 50%, retain at least 40 percent canopy cover averaged over the treatment area.
- **Within California spotted owl Home Range Core Areas:**
  Where existing vegetative conditions permit, retain at least 50% canopy cover averaged within the treatment unit. Exceptions may be allowed in limited situations where additional trees must be removed to adequately reduce ladder fuels to minimize re-entry. Where 50% canopy cover retention cannot be met for reasons described above, retain at least 40% canopy cover averaged within the treatment area (SNFPA ROD, p. 51, S&G 7).
- **Outside of California spotted owl Home Range Core Areas:**
  Where existing vegetative conditions permit, retain at least 50% canopy cover averaged within the treatment unit. Exceptions may be allowed where project objectives require additional canopy modification (such as the need to adequately reduce ladder fuels, provide for safe and efficient equipment operations, minimize re-entry, design cost efficient treatments, and/or significantly reduce stand density.). Where canopy cover must be reduced below 50%, retain at least 40% canopy cover averaged within the treatment unit (SNFPA ROD, p. 51, S&G 7).
- **Within California spotted owl PACs.** Where treatment is necessary, remove only material needed to meet project fuels objectives. Focus on removal of surface and ladder fuels.

Heterogeneity:

- To enhance stand heterogeneity, maintain hiding cover for animals and/or their prey, and maintain biological processes, do not mechanically treat the remaining 25% of the stand area.
- Retain at least one clump of 3-5 commercial sized trees with connected crowns per acre for wildlife habitat. If possible, establish these clumps so they include trees greater than 24 inches dbh with cavities. In any case, use the largest trees available and locate the clumps in or adjacent to patches of brush and small trees, SMZs, rocky piles, and large woody debris.

HYDROLOGY

Log Landing Location

- Locate new landings or reuse old landings in such a way as to avoid watershed impacts and associated water quality degradation.

ALTERNATIVE 3 – NON-COMMERCIAL TREATMENTS

This treatment responds to the issue identified in scoping comments regarding fuels management, a request for a non-commercial alternative, potential effects on wildlife habitat, soils and watershed from thinning trees greater than 8 inches dbh with mechanical equipment. Under Alternative 3, the Sequoia National Forest proposes to treat 4,898 acres of the 11,000 acres in Tobias project area, using a combination of hand thinning, mastication and prescribed fire (See Table 4). The units and acres proposed for treatment are the same as those proposed in Alternative 2, however, only hand treatment and mastication methods would be employed to thin trees and vegetation less than 8 inches dbh and treat accumulations of activity and ground fuels with prescribed fire. While no commercial product removal would be proposed, personal use firewood gathering would be permitted from treated areas.

Table 4. Alternative 3 – Vegetation Management Activities

Type of Stands	Approximate Treatment Acres	Proposed Vegetation Treatments	Product Removal
Mid to Late-Successional Forest Stands – 40 to 150 years old overstory	Mastication (720)	Non-commercial (selective) thinning trees measuring 8 inches dbh and smaller	1,000 ccf of firewood
	Hand (397)		
Early Successional Forest Stands – 0 to 40 years old overstory	Mastication (2,158)	Hand felling, mastication and pile/burning of trees 8" dbh and smaller and brush to break up ladder fuels	1,000 ccf of firewood
	Hand (1,239)		
Over mature stands – over 150 years old overstory	Underburn (384)	2nd entry Rx burns for stands within California spotted owl PACs and HRCAs	No product removed
Total Treatment	**4,898 Acs.**		**2,000 ccf of firewood**

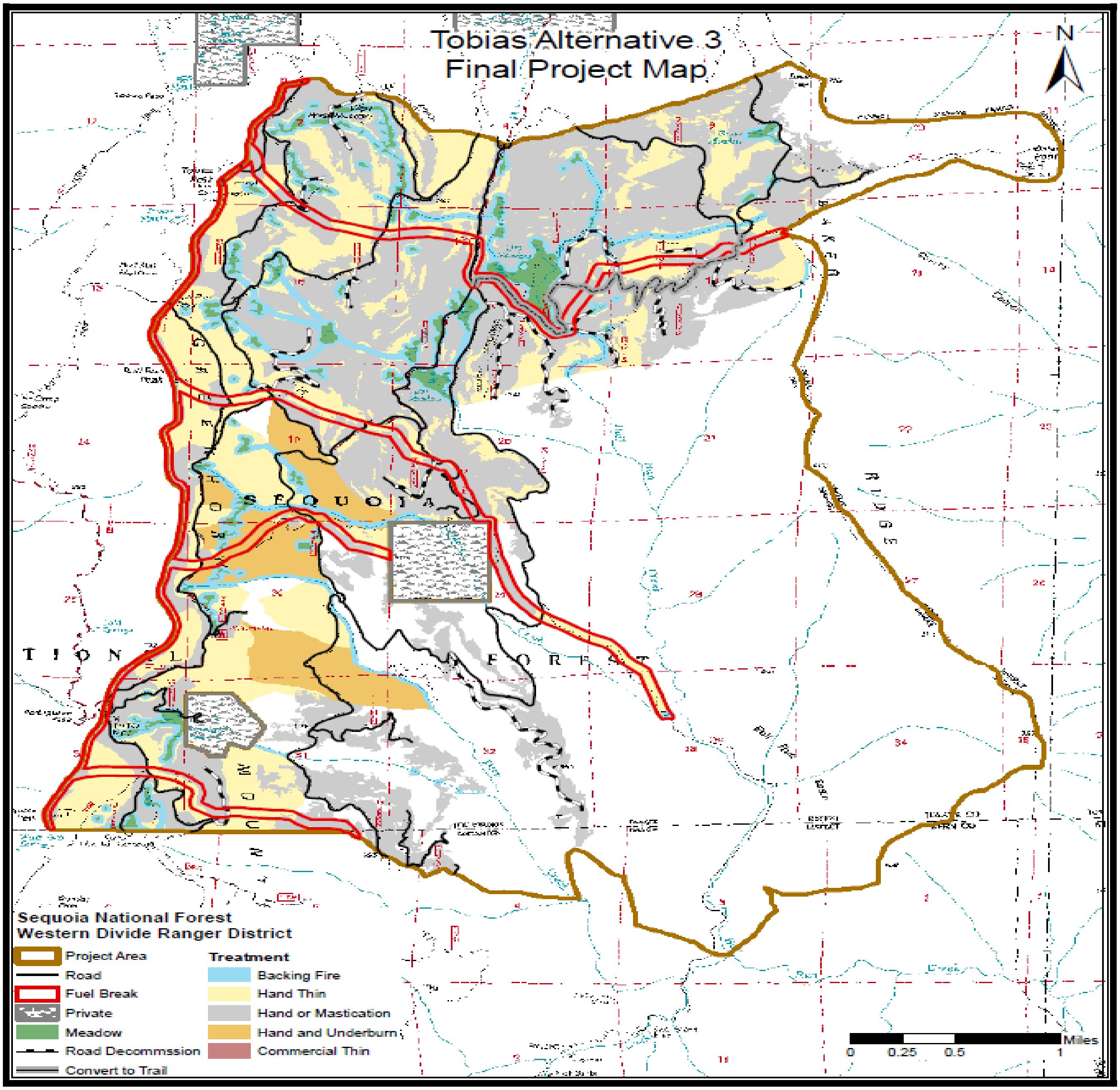


Figure 3. Alternative 3 Map of Activities

ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

1. **A Giant Sequoia National Monument management alternative and an alternative with reduced crown thinning/spacing** were considered. One respondent requested that the Tobias Project area be managed in a way similar to the nearby Giant Sequoia National Monument, with limited tree removal. Alternative 1, No Action, and Alternative 3, Non-commercial Treatment will effectively address management strategies similar to the GSNM.

2. An alternative similar to the Healthy Forests Restoration Act (HFRA) has been considered. One respondent requested that the Tobias Project treat areas as though they are under HFRA. All action alternatives including Alternative 2, the proposed action; and Alternative 3, Non-commercial Treatment consider management alternatives to achieve goals compatible with the HFRA.

COMPARISON OF ALTERNATIVES

The following table provides a summary of the effects of implementing each alternative. Information in the table is focused on those activities and effects that can be distinguished quantitatively or qualitatively between the alternatives. The three types of stands delineated in Tables 2 and 4 are in Table 5.

Table 5. Comparison of Alternatives Table

	Alternative 1 No Action	**Alternative 2 Proposed Action**	**Alternative 3 Non-commercial**
Silvicultural Prescription	NA	Manage stand density with uneven-aged cutting	Thin trees 8 inches and smaller from below. This would be even-aged cutting.
Maximum dbh at which a tree could be selected for removal	NA	29.9 inches	8 inches
Existing Trees/Acres Post-Treatment Trees/Acres	NA	Existing = 389 Trees/Acre Post = 114 Trees/Acre	Existing = 595 Trees/Acre Post = 172 Trees/Acre
Stand Density Index (existing and Post-treatment 2013)	NA	Existing = 364 Trees/Acre Post = 241Trees/Acre	Existing = 297 Trees/Acre Post = 131 Trees/Acre
Basal area	NA	Existing = 208 After treatment = 167	142 68
Canopy cover	NA	Existing = 70 After treatment = 54	100 67
Average diameter	NA	Existing = 12 After treatment = 17	6 9
Average top height	NA	Existing = 68 After treatment = 80	38 51
Sawtimber (million board feet)	NA	4 million board feet	0

CHAPTER 3: AFFECTED ENVIRONMENT

TRANSPORTATION AND ROADS

AFFECTED ENVIRONMENT

The transportation system for the Tobias project consists of National Forest System roads, and non-system roads (temporary roads). An analysis of the project area identified approximately 46.57 miles of total road system. The area includes approximately 45.06 miles of NFS roads, and 1.51 miles of non-system roads (temporary roads).

The transportation system in the Tobias area serves a variety of resource management activities and access needs (primarily vegetation management and recreation access). The area also supports activities such as dispersed recreation, hunting, firewood collection, and monitoring of wildlife.

The Tobias area has its basic transportation system in place with mainly Forest Service local (maintenance level 2 and 3) roads. Primary access to the project area is provided by Sugarloaf Road (Forest Road No. 26S16). Current traffic pattern is generally confined to through traffic on Sugarloaf Road. The maintenance level 2 roads are generally used by hunters and recreationists for pleasure driving. Many drivers use off-highway vehicles (OHVs), 4-wheel drive pickups, or jeeps in their activities on these roads and on non-system roads. Local access roads constructed during previous entries exist in poor to good condition. Non-system roads exist in varying conditions. The following table summarizes the roads identified within the project area and their mileage.

Table 7. Existing System Roads within Project Area

Road #	Road Name	Current Operational Maintenance Level	Length	Allowed Uses
23S16	Sugarloaf	ML 4 - Suitable for Passenger Vehicles	5.89	Highway Vehicles ONLY
24S02	Baker Point	ML 2 - High Clearance Vehicles	2.5	Open to ALL Vehicles
24S03	Schultz	ML 2 - High Clearance Vehicles	1.5	Open to ALL Vehicles
24S08	Tobias Peak Lookout	ML 2 - High Clearance Vehicles	0.94	Open to ALL Vehicles
24S09	Panorama	ML 2 - High Clearance Vehicles	0.33	Open to ALL Vehicles
24S10	Portuguese Meadow	ML 2 - High Clearance Vehicles	0.65	Admin Access ONLY
24S15	Portuguese Meadow	ML 3 - Suitable for Passenger Vehicles	1.41	Highway Vehicles ONLY

Road #	Road Name	Current Operational Maintenance Level	Length	Allowed Uses
24S15A	Portuguese Meadow	ML 1 - Closed to ALL Motor Vehicles	0.46	Close to ALL Motor Vehicles
24S24	Tobias Meadow	ML 2 - High Clearance Vehicles	2.1	Open to ALL Vehicles
24S24A	Tobias Meadow	ML 1 - Closed to ALL Motor Vehicles	0.6	Close to ALL Motor Vehicles
24S25	Mc Swiney Bldvd	ML 2 - High Clearance Vehicles	2.4	Open to ALL Vehicles
24S25A	Mc Swiney Bldvd	ML 1 - Closed to ALL Motor Vehicles	0.3	Close to ALL Motor Vehicles
24S25B	Mc Swiney Bldvd	ML 1 - Closed to ALL Motor Vehicles	0.3	Close to ALL Motor Vehicles
24S28	Sunday Peak	ML 2 - High Clearance Vehicles	0.36	Open to ALL Vehicles
24S34	Tyler Meadow	ML 2 - High Clearance Vehicles	1.55	Open to ALL Vehicles
24S34A	Tyler Meadow	ML 2 - High Clearance Vehicles	0.3	Open to ALL Vehicles
24S35	Shultz Creek	ML 2 - High Clearance Vehicles	8.16	Open to ALL Vehicles
24S35A	Shultz Creek	ML 2 - High Clearance Vehicles	0.83	Admin Access ONLY
24S35C	Shultz Creek	ML 2 - High Clearance Vehicles	1.4	Admin Access ONLY
24S37	South Dry Mdw	ML 2 - High Clearance Vehicles	1.1	Open to ALL Vehicles
24S37A	South Dry Mdw	ML 1 - Closed to ALL Motor Vehicles	0.6	Close to ALL Motor Vehicles
24S45	Stormy Canyon	ML 2 - High Clearance Vehicles	0.47	Admin Access ONLY
24S45A	Stormy Canyon	ML 1 - Closed to ALL Motor Vehicles	0.3	Close to ALL Motor Vehicles
24S46	Deep Creek	ML 1 - Closed to ALL Motor Vehicles	1.15	Close to ALL Motor Vehicles
24S46A	Deep Creek	ML 2 - High Clearance Vehicles	0.6	Admin Access ONLY

Road #	Road Name	Current Operational Maintenance Level	Length	Allowed Uses
24S50	Greenhorn Mountain	ML 2 - High Clearance Vehicles	1.06	Open to ALL Vehicles
24S77	East Horse	ML 2 - High Clearance Vehicles	1.5	Open to ALL Vehicles
24S80	Lower Dry Meadow	ML 2 - High Clearance Vehicles	1.37	Open to ALL Vehicles
24S80A	Lower Dry Meadow	ML 2 - High Clearance Vehicles	0.68	Open to ALL Vehicles
24S80B	Lower Dry Meadow	ML 1 - Closed to ALL Motor Vehicles	0.29	Close to ALL Motor Vehicles
24S80C	Lower Dry Meadow	ML 2 - High Clearance Vehicles	0.45	Open to ALL Vehicles
24S83	Upper Dry Meadow	ML 2 - High Clearance Vehicles	1.36	Open to ALL Vehicles
24S83A	Upper Dry Meadow	ML 1 - Closed to ALL Motor Vehicles	0.76	Close to ALL Motor Vehicles
25S37	Cave	ML 2 - High Clearance Vehicles	0.44	Open to ALL Vehicles
25S37A	Cave	ML 1 - Closed to ALL Motor Vehicles	0.5	Close to ALL Motor Vehicles
25S38A	Bull Run Basin	ML 2 - High Clearance Vehicles	0.45	Open to ALL Vehicles

Table 8. Existing non-System Temporary Roads Within Project Area

Road #	Road Name	Current Operational Maintenance	Length	Allowed Uses
Temp Rd 1	Temp Rd 1	n/a	0.29	Closed, Not Accessible
Temp Rd 2	Temp Rd 2	n/a	0.10	Closed, Not Accessible
Temp Rd 3	Temp Rd 3	n/a	0.18	Closed, Not Accessible
Temp Rd 4	Temp Rd 4	n/a	0.11	Closed, Not Accessible
Temp Rd 5	Temp Rd 5	n/a	0.06	Closed, Not Accessible

Road #	Road Name	Current Operational Maintenance	Length	Allowed Uses
Temp Rd 6	Temp Rd 6	n/a	0.46	Closed, Not Accessible
Temp Rd 8	Temp Rd 8	n/a	0.10	Closed, Not Accessible
Temp Rd 10	Temp Rd 10	n/a	0.24	Closed, Not Accessible

The conditions of the roads vary from well-maintained to badly eroding. Due to the limitations of National Forest road maintenance capability, most designated roads do not receive all required maintenance. Non-system roads do not receive maintenance.

Road Funding

Road maintenance is accomplished on Forest Service roads by a combination of Forest Service crews, contractors, permit holders, and timber sale purchasers. Forest Service crews and contractors are primarily funded by appropriated dollars and collection accounts. The collection accounts are surface replacement deposits collected from commercial users of the road system. These commercial users are primarily timber sale purchasers, operating in both Forest Service and private lands. Other commercial uses such as mining which may pay deposits occur infrequently on this Forest.

Timber purchasers are required to maintain the roads they use for harvesting timber. Timber sales have provisions for pre-haul, during haul, and post haul maintenance. The provisions require activities such as brushing, drainage cleaning, surface blading, and other maintenance requirements to protect the surrounding environment. Moreover, timber purchasers are required to make improvements needed to existing roads to accommodate their haul, and to construct new temporary roads needed for their harvesting operations.

The Sequoia National Forest has not received enough funding to maintain all roads on a regular basis, which has resulted in delaying maintenance activities. This is noted as deferred maintenance in Forest Service investment tracking. The roads in the Tobias project would require maintenance prior to use. The deferred maintenance activities are primarily surface blading, replacing drainage features, spot placement of aggregate, and brushing.

Transportation System Needs

The transportation system needs for the Tobias project would be served by existing Forest Service roads wherever possible. While the basic transportation system is in place for access, some road segments would need maintenance and reconstruction for the logging trucks and other project vehicles to have access.

Temporary road spurs would be limited to short segments to serve selected units or landings. Temporary roads should use a 50-foot minimum radius curve and a 14-foot wide road bed for a single lane road. The critical design vehicle would be a log truck or a lowboy with design standards varying accordingly.

Some road segments may be designated as temporary roads. Temporary roads are not intended to be a permanent part of the road system and would be decommissioned following harvesting activities. Temporary roads may be existing non-system roads which are intended to be used for this project only and then decommissioned.

Throughout the project area, 8 temporary roads totaling approximately 1.54 miles in length have been identified for possible use and would be reopened for the Tobias Project. These roads are existing non-system roads that may need maintenance before use (e.g. blading, clearing, etc.), and would be decommissioned after use. About 3.46 miles of new temporary roads would be constructed. These roads would be short segments to serve selected units and then decommissioned. About 1.2 miles of road would need reconstruction to accommodate logging trucks and other project vehicles and to restore drainage functions.

During harvesting operations, other existing roads may be identified as needed for the project. Use of such roads can be requested by the purchaser and authorized by the Forest Service through written agreement.

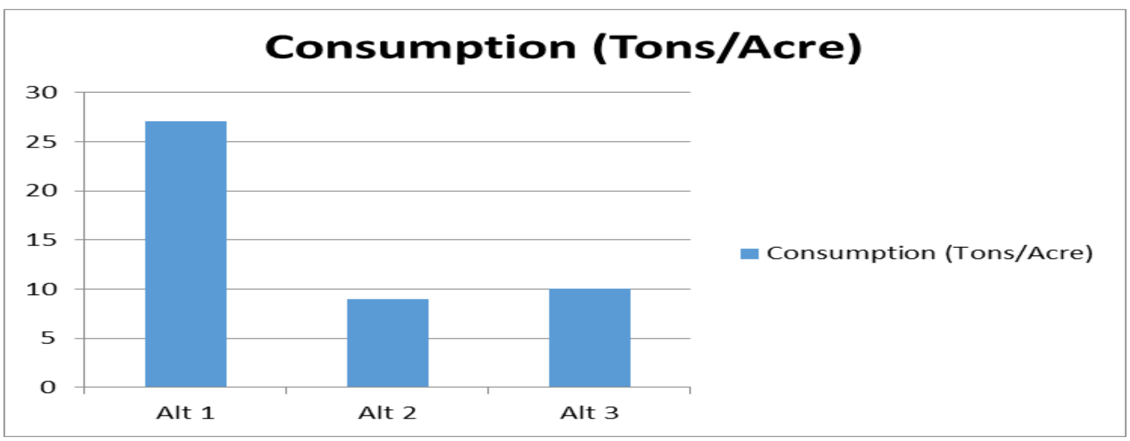
AIR QUALITY

AFFECTED ENVIRONMENT

SMOKE EMISSIONS ESTIMATES

The Fire and Fuels Extension (FFE) to the Forest Vegetation Simulator (FVS) was used to calculate the fuel consumption of a post treatment wildfire for each alternative. The consumption was calculated for the treated acres, which are the same in both the action alternatives. The fuel consumption for untreated acres within the project boundary would be the same for all three alternatives, but this doesn't factor the increased success of suppressing a wildfire in the treated areas. Figure X below shows the average post treatment fuel consumption per acre if a wildfire occurred within the treated areas.

Figure 4. Average fuel consumption of a wildfire in the proposed treatment area.



The amounts of individual emissions for a post treatment wildfire are displayed in the Table 9 below. Emissions are proportional to amount fuels consumed (Hardy, et al., 2001). The emission amounts were derived by using the San Joaquin Valley Air Pollution Control District's emissions reporting spreadsheet.

Table 9. Emissions for a wildfire burning in proposed treatment area.

Alternative	Treated Acres	Tons per Acre	Total Tons	Tons PM10	Tons PM2.5	Tons NO_X	Tons SO_2	Tons VOC	Tons CO
1-No Action	4,897	27	132,734	1626.0	1,460.1	232.3	6.6	962.3	15,463.5
2- Commercial	4,897	9	43,727	535.7	481.0	76.5	2.2	317.0	5,094.2
3-Non-Commerical	4,897	10	49,160	602.2	540.8	86.0	2.5	356.4	5,727.2

SMOKE SENSITIVE AREAS

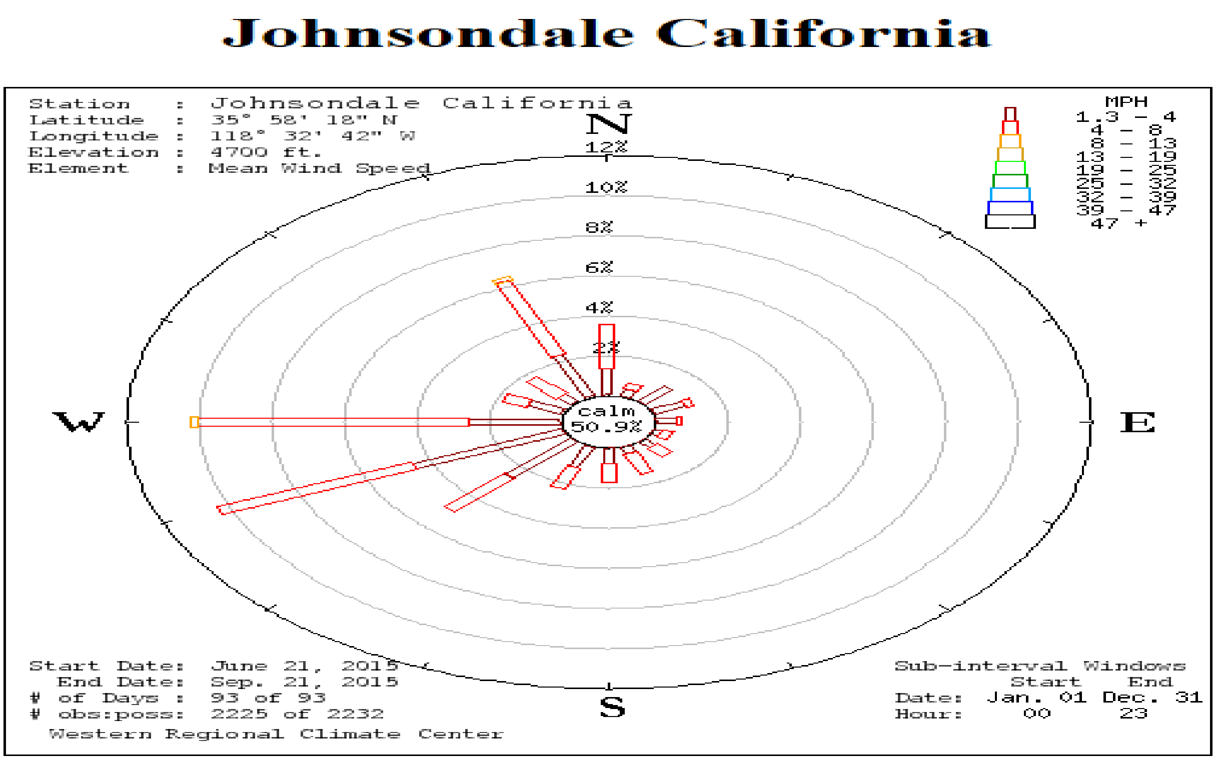
The location of the Tobias project places it within the jurisdiction of the San Joaquin Valley Air Pollution Control District (SJVAPCD) with the Eastern Kern Air Pollution Control District and the Great Basin Unified Air Pollution Control District being secondary and tertiary air districts. Even though the project area is in a remote location, a wildfire has the potential to affect all three air districts, two designated mandatory federal “Class 1” areas, the Tule River Indian Reservation and several communities (see Table 10).

Air quality effects to sensitive areas are dependent on the amount of smoke and meteorological conditions such as the mixing height and the strength/direction of the transport winds. The project area is usually subjected to diurnal weather patterns unless influenced by passing weather systems. The diurnal winds are upslope/up canyon in the day and down-slope/down-canyon at night. The winds at the closest RAWS during the summer are illustrated in the wind rose graph in figure 5. They are usually west or west southwest with a northerly component during the evening. Monsoonal moisture during the summer months can often bring thunderstorms over the project area. The fall, winter and spring will have a stronger northerly component and a higher potential for storm systems or an east wind event. The elevation of the project area, 5,200 to over 8,250 feet, is usually above inversion layers, but smoke east or west of the project will settle into the valleys. History has shown that smoke from fires in the Kern River watershed will settle towards Kernville in the evening. This is usually exacerbated when the smoke production is high and transport winds limit the dispersion of smoke east of the Kern River watershed into the Owens Valley or Mojave Desert. An east wind component during a wildfire in the Tobias Project area will transport smoke towards Bakersfield and the San Joaquin Valley.

Table 10. Distance and direction of smoke sensitive areas from the center of the project area.

Sensitive Area	Sequoia Kings Canyon NP (Class 1 Area)	Ridgecrest/China Lake Naval Weapons Center	Johnsondale	Kernville	Glennville	Hot Springs
Air Miles Distance	35	51	11	8	10	8
Azimuth (Degrees)	357	104	3	122	234	302
Sensitive Area	Dome Land Wilderness (Class 1 Area)	Tule River Reservation	Panorama Heights	Sugarloaf	Bakersfield	Porterville
Air Miles Distance	17	19	5	5	40	32
Azimuth (Degrees)	67	325	259	277	223	303

Figure 5. Wind rose graph displaying the wind speed/direction from Johnsondale RAWS during the summer of 2015



SMOKE DISPERSION

The Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model was used to demonstrate smoke dispersion for both a wildfire and pile burning on the Tobias project. The dispersion modeling is based on terrain and meteorological inputs. The HYSPLIT model can use either historic or forecasted weather data. For the wildfire dispersion scenario (Figure 6), August 15th, 2015 was arbitrary chosen to represent a typical summer day during the fire season. For the pile burn scenario (Figure 7), November 15th, 2015 was chosen as a typical fall burn day. Different weather patterns can result in vastly different outputs. For example, if winds are out of the east, the smoke plume will head towards the San Joaquin Valley and the city of Bakersfield (Figure 8). One advantage of prescribed burning is that the amount, duration and timing can be managed to reduce smoke impacts.

Figure 6. 1st day Smoke dispersion for a Tobias wildfire using August 15, 2015 weather conditions.

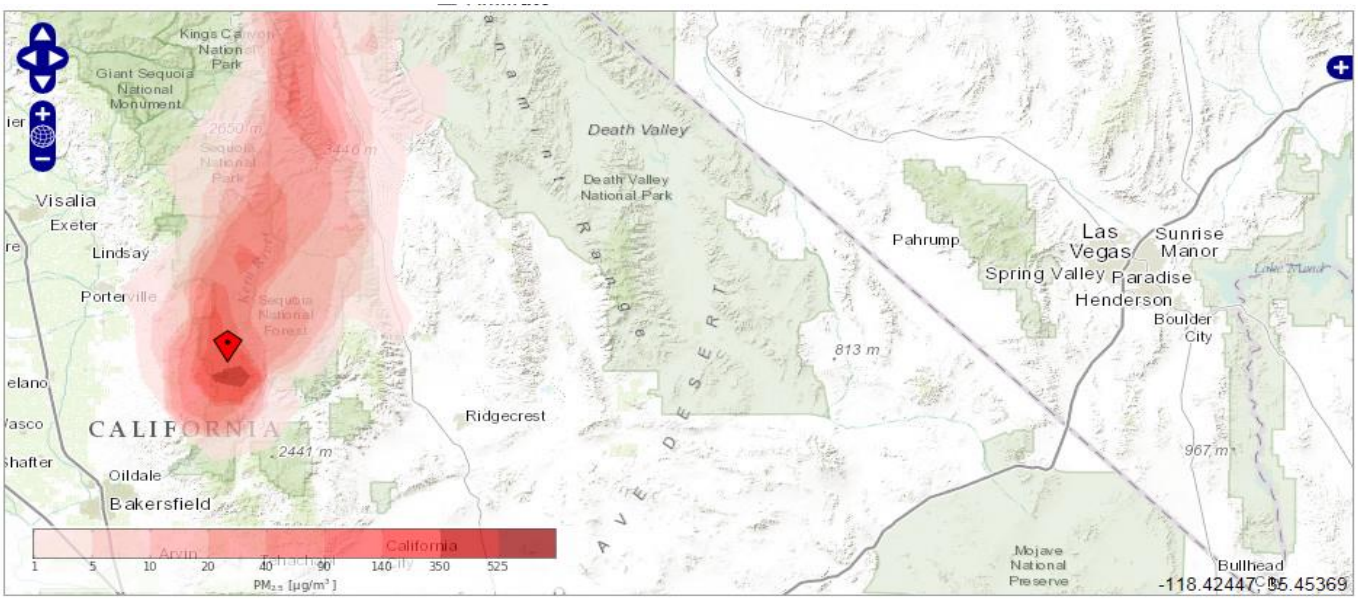


Figure 7. Smoke dispersion for 2nd day of a Tobias Wildfire using August 16, 2015 weather conditions.

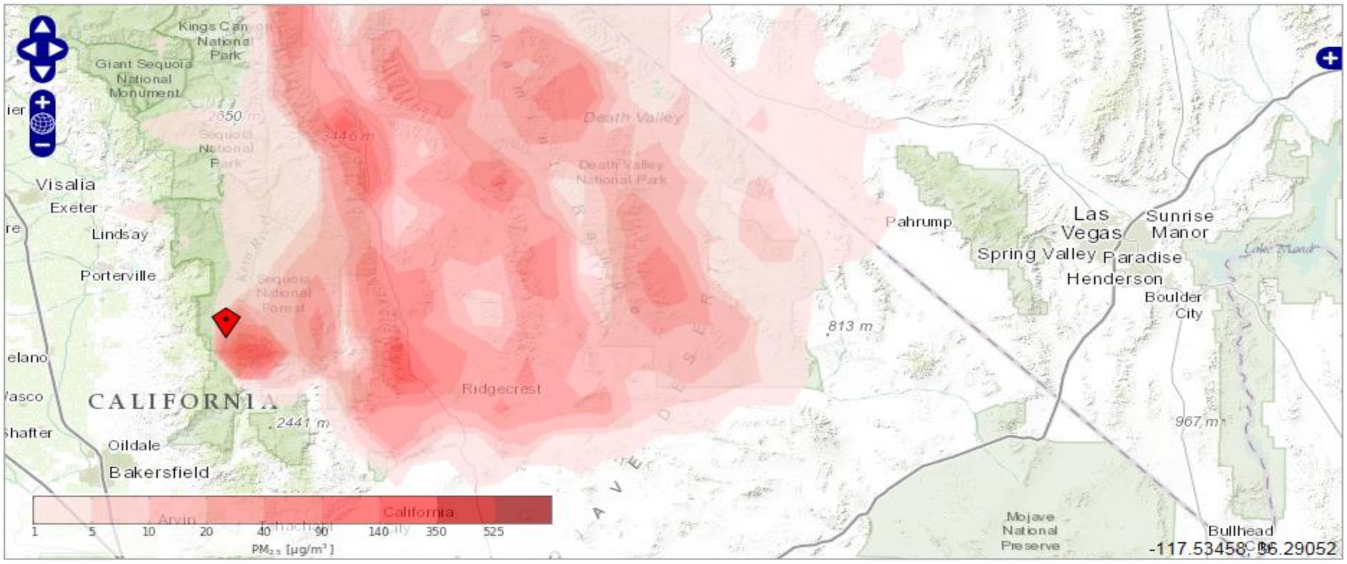


Figure 8. Smoke disperson from the 2nd day of a Tobias wildfire burning with east wind event.

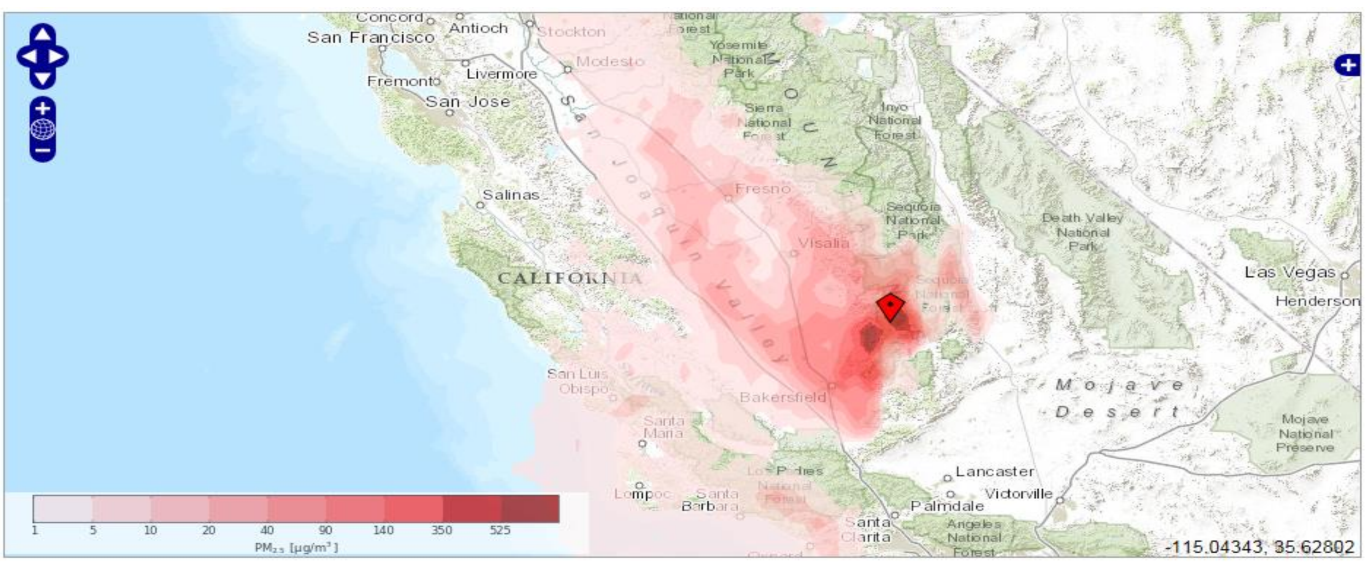
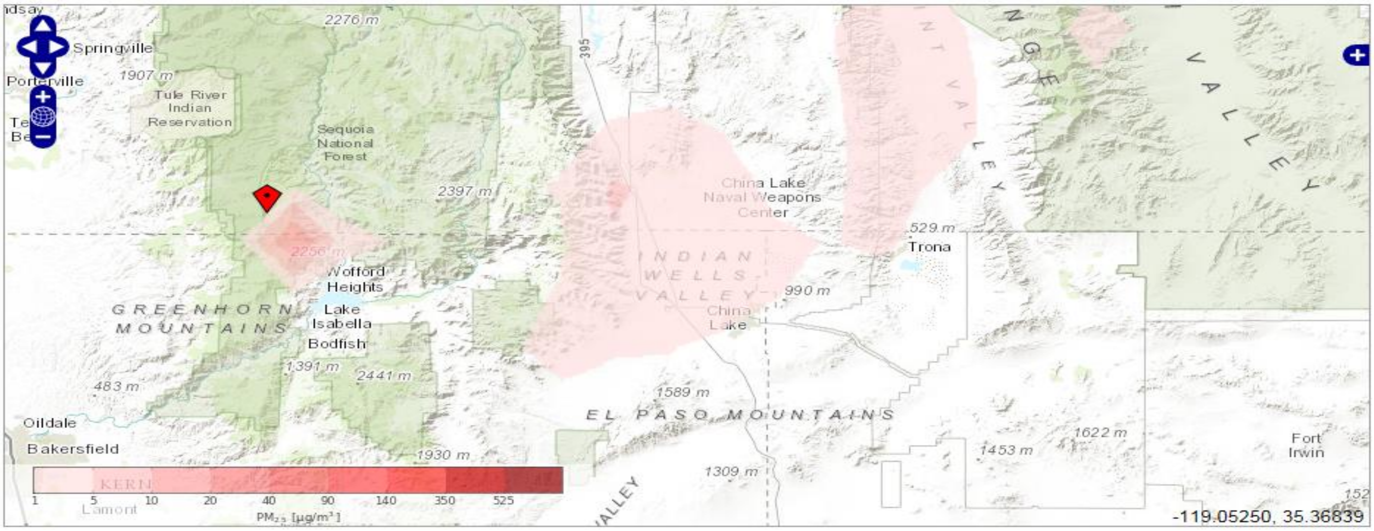


Figure 9. Smoke dispersion for Pile burning using November 15, 2015 weather conditons.



CONFORMITY

The location of the Tobias project has been designated as a non-attainment area for ozone, suspended particulate matter (PM10) and fine suspended particulate matter (PM2.5). This means the area does not meet the National Ambient Air Quality Standards (NAAQS) or the California Ambient Air Quality Standard (CAAQS) for a given air pollutant. A federal agency action that takes place in a nonattainment area must comply with general conformity requirements, as contained in Title 40 of the Code of Federal Regulations (CFR) Part 93, Subpart B. The conformity determination process is intended to demonstrate that a proposed federal action will not: (1) cause or contribute to new violations of a national ambient air quality standard (NAAQS); (2) interfere with provisions in the applicable State Implementation Plan (SIP) for maintenance of any NAAQS; (3) increase the frequency or severity of existing violations of any standard; or (4) delay the timely attainment of any standard.

Prescribed fires conducted in accordance with a smoke management program which meets the requirement of the EPA’s Interim Air Quality Policy on wildland and Prescribed Fires or an equivalent replacement policy are “presumed to conform” per general conformity applicability (40 CFR 93.153.153(i)(2)). The Forest will follow Title 17 of the California Code of Regulation – Subchapter 2, Smoke Management Guidelines for Agriculture and Prescribed Burning. The EPA has approved California's revised Title 17 regulations as an equivalent of a smoke management program.

Prescribed burning, which includes both piles and under burning, will only occur after approval from the SJVAPCD. Prior to burning, a smoke management plan will be submitted and approved in the Prescribed Fire Information Reporting System (PFIRS) or other current process. PFIRS ("P-furs") is an internet based system that serves as an interface between air quality managers, land management agencies, and individuals that conduct prescribed burning in California. It is intended to facilitate communications by providing access to a database containing information on burn planning, burn approvals, and emissions information. PFIRS helps air quality managers assess and regulate cumulative prescribed fire impacts to an airshed. Secondary and tertiary air districts will be identified in PFIRS and consulted as needed.

Smoke Management

The implementation of the action alternatives will create emissions from prescribed burning. Prescribed burning will only occur after approval from the San Joaquin Valley Air Pollution Control District. Unlike a wildfire, prescribed burning can be segmented to manage the amount, timing and distribution of emissions based on favorable dispersal conditions. Burn piles have an increased combustion efficiency compared to forest fuels, which lowers the particulate emissions per ton of fuel consumed (Hardy, et al., 2001). Table 11 below compares the emissions that will be generated during the implementation of prescribed burning. The no action alternative is not shown because no prescribe fire emissions will occur.

Table 11. Emissions from prescribed burning.

Alt	Acres/Type of burn	Tons Per Acre	Total Tons	Tons PM10	Tons PM2.5	Tons NO_X	Tons SO_2	Tons VOC	Tons CO
2	384/Understory-2nd entry	5	1,920	24	21	3.36	0.10	14	224
	2,158/hand piles	10	21,580	84	79	56.11	0.11	68	712
	1,117/hand piles/logging slash	20	22,340	87	82	58.08	0.11	70	737
Alternative 2 Totals			**45,840**	**195**	**182**	**117.55**	**0.32**	**152**	**1,673**
3	384/Understory-2nd entry	5	1,920	24	21	3.36	0.10	14	224
	2,021/hand piles	10	20,210	79	74	52.55	0.10	64	667
Alternative 3 Totals			**22,130**	**103**	**95**	**55.91**	**0.20**	**78**	**891**

The masticated units on the Tobias project will not be burned, the slash will be left on the ground. The masticated units will still have the same fuel amounts, but the arrangement will be on the surface. Freshly masticated units may be vulnerable to pre-masticated consumption levels in the event of a wildfire, but the crown fire potential will be lower because of the increase in canopy base height. Over time, masticated fuels will compact and decompose.

This project will have segments that can be burned individually, or if conditions occur to take advantage of optimum burning conditions, more areas can be ignited within the same weather pattern. Target fuels will be dry to consume quickly and limit smoldering. Personnel on site will monitor smoke conditions and mobile monitors (E-BAM) can be requested at smoke sensitive areas as needed.

Assumptions and Limitations of Models

All models are inherently wrong and only provide an approximation of reality (Stratton 2006). This does not mean models are not useful; the outputs need to be interpreted given the model assumptions and limitations. Most fire behavior modeling is based on the assumption of constant weather conditions and do not account for fire-induced conditions such as increased winds and fire whirls. The model does not estimate fire spread from firebrands or embers. The model assumes continuous, uniform and homogeneous fuel beds. To represent the fire behavior for the Tobias project, modeling outputs were conducted for each fuel model and then a weighted average was calculated using the acres of each fuel model. The modeling for this project assumed 90th percentile weather conditions on an east aspect. The results are best used to compare the relative effects of the alternatives, rather than an indicator of absolute effects.

Spatial and Temporal Context for Effects Analysis

The spatial area for the fire and fuels effects analysis is project boundary. This boundary was chosen because it coincides with the upper boundary of the Bull Run Creek watershed. Watershed or sub watershed boundaries are usually ridges or topographically transitional areas that are effective at stopping wildfires. The temporal context is plus or minus 25 years. This timeframe was chosen because of the 1990 Stormy Fire and it is about the maximum duration of the effectiveness of fuel treatments in this fuel type.

Botanical Resources

Affected Environment

The project area is located on the east side of the Greenhorn Mountains in the Bull Run Drainage from 5,200 feet to over 8,250 feet. Plant communities include Chaparral, Canyon Live Oak Woodland, Black Oak Woodland, Mountain Meadow, Rock Outcrop, Lower Mixed Conifer-Pine, Mixed Conifer-White Fir, Mixed Fir Forest, Montane Brushfield, and Red Fir Forest.

A search of the Sequoia National Forest sensitive plant database and geographic information system (GIS) layer found populations of *Calochortus westonii*, *Carlquista muirii*, and *Delphinium inopinum* within the project area. A search of the California Natural Diversity Data Base (CDFW 2015) for the Tobias Peak, 7.5 minute map quadrangle, in which the Tobias Ecosystem Restoration Project is located, returned occurrences of the FS Sensitive Species *Calochortus westonii, Delphinium inopinum and Fritillaria brandegeei.*

Watch list plant species in Region 5 are plants of local concern that are not on the R5 sensitive list. The watch list may include plants on various California State or California Native Plant Society (CNPS) lists or may be added due to local rarity, human impacts (such as collection), location at the edge of their range, or other reasons. Generally the potential for watch list plants to occur in a proposed analysis area would not necessitate botanical surveys, but they are inventoried incidentally, while performing surveys for any Sequoia NF sensitive plants.

The Tobias Project mechanical activity units were surveyed for sensitive plants and watch list plants in the late spring and early summer of 2013 and additional units added. These surveys confirmed occurrences of Shirley Meadow star-tulip, (*Calochortus westonii*) within mastication units. No Forest Service Sensitive plants were discovered within proposed mechanical tractor and skyline units. Additionally, no Forest Service watch list plants were discovered within mechanical harvest units.

Species accounts are summarized here with specific intent to focus on location or habitat preferences that may be affected by the proposed action.

Table 12. Plant Species of Concern within the Tobias Ecosystem Restoration Project Area

Common Name **Status** *Scientific name*	**Habitat Type / Soils / Elevation**	**Risk/Rationale**
Shirley Meadow Star-Tulip FS (*Calochortus westonii*)	Openings in Chaparral, Ponderosa Pine, or Mixed Coniferous Forest, 4,900 to 6,800 ft. Granite Ledges/Cracks or Gravelly/Sandy Flats	Moderate, in meadow and moist mixed conifer forest
Muir's Raillardella FS (*Carlquista muirii*)	Openings in Chaparral, Ponderosa Pine, or Mixed Coniferous Forest, 3,600 to 8,200 ft. Granite Ledges/Cracks or Gravelly/Sandy Flats	Low, on rock outcrops and in sandy flats.
Unexpected Larkspur FS (*Delphinium inopinum*)	Open Rock Outcrops & Ridges in Conifer and Red Fir Forest, 5,500 to 9,000 ft. Metamorphic Substrates (Granite Occasionally)	Low, on rock outcrops.
Greenhorn Fritilary FS (*Fritillaria brandegeei*)	Openings in lower mixer Conifer Forest and Black Oak Woodland, 4,200 to 7,300 ft. Sandy Granitic soil or Shallow Decomposed Granite Deposits	Moderate, in mixed conifer forest.

FS = FS Sensitive Species

Federally Protected (Listed) Species

There are no federally protected plants or suitable habitats for such species in the project vicinity.

Forest Service Sensitive Species (including Federal Candidates)

Forest Service sensitive species were eliminated from further consideration if: 1) they had no known occurrences in or near the project area; and/or 2) no potentially suitable habitat for the species exists in the project area (see full list of species considered in appendix A).

The analysis area has known populations or unsurveyed suitable habitat for the Pacific Southwest Region (R5) Forest Service Sensitive plant species displayed in Table 12.

Shirley Meadow Star-Tulip, (*Calochortus westonii*)

Abundance: Over 1,200 acres of known habitat; occurrences may fluctuate, depending on varying habitat conditions. At least 20-30 extant occurrences currently known, most with dozens to thousands of plants each.

Range/Distribution: Currently known range approximately 50 miles (north-south) by 16 miles (east-west) in the Tule River and Kern River drainages of Tulare and Kern Counties, respectively. Occurrences may be either small, apparently isolated pockets of plants or large, contiguous colonies scattered from as far north and west as Case Mountain, to just below Mountain Home State Forest and the Camp Nelson area, to as far east as Baker Point Road and the Vincent/Dry/Tyler Meadows area, to as far south as the type locality at Shirley Meadows and Cooks Peak and a short distance below. The Case Mountain population(s) is on BLM land, and a few tracts of private land within Sequoia NF include occurrences of Calochortus westonii. The majority of populations and habitat, however, exist on NFS lands (Sequoia NF).

Trend: Unknown; presumably stable. *Calochortus westonii* was initially thought to be a highly localized endemic of the area around Shirley Peak in the Greenhorn Mountains after it was collected and tentatively identified in 1927. In 1984, a Species Management Guide was developed to provide protection primarily in relation to timber harvest and ensure long-term conservation of the species. Five more occurrences were discovered in 1990 approximately 10 miles to the north just before a large wildfire burned over 2,400 acres throughout much of the area. Approximately 115 acres of additional occurrences were found throughout the burned area during post-fire surveys (1991), and were flagged and excluded from salvage timber harvest, according to a 1990 agreement with USFWS. Many of those occurrences did not persist, however, in subsequent post-fire years in burned habitat in which ecological conditions were not suitable for the species. Apparently established occurrences have been found in many areas north of the burn since then (1992-1996). Populations appear to be able to tolerate moderate disturbance (the species is a bulbiferous, perennial herb), and have the potential to colonize new sites when habitat conditions are suitable.

Protection of Occurrences: Since 1990, the USFS has implemented a "flag and avoid" policy for *Calochortus westonii*, according to an agreement with the USFWS. The 1984 Species Management Guide was updated in 1997 to incorporate new demographic information and propose similar (and additional) land management recommendations for enhancing suitable habitat and protecting and promoting the species.

Threats: Timber harvest and related activities (potential), over-grazing, off road vehicles, competition from larger, more "aggressive" species.

Fragility/habitat specificity: Habitat for *Calochortus westonii* is typically partially open, mixed conifer/black oak and associated dry meadow edges, from approximately 5,000 to 7,200 feet elevation. Soils may be granitic or metamorphic and are moderately loamy and deep when occurring in or adjacent to meadows and dry out early in the season. They may also be somewhat shallower and rockier on steeper forest slopes (usually less than 40% slope).

MUIR'S RAILLARDELLA, (CARLQUISTA MUIRII)

General Distribution: *Carlquistia muirii* is known from 21 occurrences that range across an estimated 200-mile (322-kilometer) section of the southern Sierra Nevada in Fresno, Tulare, and Kern Counties. One disjunct occurrence is found on the Los Padres National Forest 160 miles (257 kilometers) to the west in the Ventana Wilderness in Monterey County.

Habitat Description: *Carlquistia muirii* occurs in dry open sites on granitic soils at elevations of 3,600-8,200 feet (1,100–2,500 meters). It grows from granite ledges and crevices and on gravelly or sandy flats in openings of montane chaparral, ponderosa pine forest, and lower and upper mixed conifer forest.

Occurrence Status and population trends: *Carlquistia muirii* is known from 21 occurrences: 8 in the Sierra National Forest in the North Fork Kings River drainage (Fresno County), 2 in the Sequoia National Forest in the Kern River drainage (Tulare County), 5 in Kings Canyon National Park in the Kings River drainage (Fresno Co.), 4 in Sequoia NP in the Kaweah River drainage, 1 on BLM land at Owens Peak in Kern County, and 1 in the Los Padres National Forest in the Ventana Wilderness near the coast. Number of plants reported in each occurrence varies 3 to 590 plants. Around one-third of the occurrences have 100 plants or more. The species' habitat is generally undisturbed and free of nonnative undesirable plants, and overall population trends are apparently stable. Populations in the Sierra Nevada have also been assessed as stable on the basis of habitat and population conditions.

Threats or other information: For occurrences next to trails or near lookouts (Baker Point), foot traffic, cattle trampling, or trail maintenance could impact populations. Most Sierra NF occurrences are next to roads or trails, and one is along an access road to a PG&E penstock, where penstock construction work or road work pose potential threats. Habitat is generally undisturbed. The Los Padres National Forest occurrence of *Carlquistia muirii* is not subject to any known threats.

UNEXPECTED LARKSPUR, (DELPHINIUM INOPINUM)

Abundance: *Delphinium inopinum* has 32 reported occurrences, containing from approximately 10 to 100 plants in the smaller occurrences to (more often) 100's or 1000's in the larger colonies.

Range/Distribution: *Delphinium inopinum* is found in disjunct populations mostly in the Sequoia NF (the majority on the Monarch Divide, Slate Mountain, and the Piutes), the Sierra NF (Monarch Divide), as well as in Sequoia NP and on BLM land (near Lamont Peak), from Fresno County through Tulare, Inyo, and Kern Counties.

Trend: Unknown, assumed stable.

Protection of Occurrences: Occurrences along the Monarch Divide (Sierra and Sequoia NF) are in a remote area in the Monarch Wilderness, with no need of special protection. Some of the large colonies in the Slate Mtn. complex are within a candidate Botanical Area, but no specific protection measures have been established, other than management as a current FS sensitive species.

Threat(s): The Summit National Recreation Trail (31E14) runs through the middle of the Slate Mtn. colonies, putting them at some risk of adverse impact from 2-wheeled motorized and non-motorized traffic. Past and potential proposed recreation projects and timber sales on Slate Mtn. have also created potential threats requiring special management. The Piute Mountains occurrences also have potential threats from logging, mining, and recreation.

Fragility/habitat specificity: *Delphinium inopinum* inhabits dry, rock outcrops and open, rocky ridges in pine and red fir forests, at approximately 6000' to 8800' elevation. It is often found in association with FS sensitive species Eriogonum twisselmannii, E. breedlovei var. breedlovei, and Oreonana purpurascens. The more rugged sites along the Monarch Divide are relatively stable, but the saddle along the top of Slate Mountain and the Piute habitats may be vulnerable to disturbances.

GREENHORN FRITILARY, (FRITILLARIA BRANDEGEEI)

General distribution: This species is found in the southern Sierra Nevada, especially the Greenhorn Mountains, and also in the Tehachapi Mountains area. It is endemic to California.

Habitat description: *Fritillaria brandegeei* is found at elevations between about 490 and 2200 m (1600-7200 ft), although most sites are above 1250 m (4100 ft). It has been found in pine groves, in woodland, at the edges of meadows, in marshes, and on road banks. The one reported aspect was north-facing, but others may occur. The soil is granitic, and may have much or little organic material. Surrounding vegetation may be riparian, lower montane coniferous forest, mixed conifer-oak forest or woodland, or yellow pine forest.

Occurrence status and population trends: Plants of *Fritillaria brandegeei* have been reported to be scattered, but probably are patchy in forest openings. Population sizes from 2 to 400 have been documented. The number of plants flowering in a given year probably varies with climatic conditions, and some years only a few plants will flower even in a large population.

Threats or other information: Grazing, logging, foot traffic, and over-collecting have been named as threats. The reduction or loss of this species' forest opening habitat, due to growth and reproduction of conifers in these areas, may also be a threat. *Fritillaria brandegeei* is found exclusively on granitic soils, not on soils derived from ferro-magnesium rocks, and therefore its distribution may be related to edaphic conditions.

CULTURAL RESOURCES

Cultural resources are an object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. Cultural resources are prehistoric, historic, archaeological, or architectural sites, structures, places, or objects and traditional cultural properties (FSM2360.5). These resources are not mutually exclusive and can oftentimes overlap in time and space (e.g., an historic building on a prehistoric archaeological site). Descriptions of each type can be found in the *Tobias Ecosystem Restoration Project Specialist Report: Cultural Resources and Tribal and Native American Interests* (Cultural Resources Report) (Vedugo 2015), which is in the project record and incorporated by reference.

Cultural Resources are protected under the Organic Act of 1897 (Title 16, United States Code (U.S.C.), section 473-478, 479-482, 551), Antiquities Act of 1906 (16 U.S.C. 431), Historic Sites Act of 1935 (16 U.S.C. 461), National Historic Preservation Act of 1966, as amended (NHPA) (16 U.S.C. 470) and its implementing regulation 36 CFR 800, National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321-4346), Archeological and Historic Preservation Act of 1974 (AHPA) (16 U.S.C. 469), Federal Land Policy and Management Act of 1976 (FLPMA), (43 U.S.C. 1701), National Forest Management Act of 1976 (NFMA) (16 U.S.C. 1600), Archaeological Resources Protection Act of 1979 as amended (ARPA) (16 U.S.C. 47Oaa et seq.) as implemented by 36 CFR part 296, Native American Graves Protection and Repatriation Act of 1990 as amended (NAGPRA) (25 U.S.C. 3001) as implemented by 43 CFR part 10, Subpart B – Human Remains, Funerary Objects, Sacred Objects, or Objects of Cultural Patrimony From Federal or Tribal Lands, Federal Lands Recreation Enhancement Act of December 8, 2004, (REA) (16 U.S.C. 6801-6814), Executive Order 11593 - Protection and Enhancement of the Cultural Environment, issued May 13, 1971, Executive Order 13007 - Indian Sacred Sites, issued May 24, 1996, Executive Order 13175 – Consultation and Coordination with Indian Tribal Governments, issued November 6, 2000, and Executive Order 13287 – Preserve America, issued March 3, 2003. In addition archaeological collections are managed by Curation of Federally-owned and Administered Archaeological Collections, 36 CFR part 79.

The Forest Service implements these laws and regulations through Forest Service Manual 2300, Chapter 2360, and Heritage Program Management as described in Chapter 1 of this EIS. In addition the Sequoia National Forest conducts 36 CFR 800 pursuant to the *Programmatic Agreement among the U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), California State Historic Preservation Officer, Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding the Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forests of the Pacific Southwest Region* (Regional PA) (USDA 2013).

AFFECTED ENVIRONMENT

Our knowledge of cultural resources in the Tobias project area is derived from thirty-two archaeological surveys and sixty-five previously recorded archaeological sites found in the Cultural Resources Report. Within the Tobias project area there are sixty-five archaeological sites. Of these sites fifty-three are prehistoric, eight are historic, and four are multicomponent (both historic and prehistoric) (refer to Table 3 in Cultural Resources Report). These resources reflect early settlement, use, and management of the lands by indigenous people; westward expansion of Euro-American people (as well as Asian, African, and other non-European people) and resource extraction through logging and mining.

NATIVE AMERICANS, VEGETATION MANIPULATION, AND FIRE

Native Americans and the groups that inhabited the area now known as the southern Sierra manipulated the vegetation in order to provide diverse and sustainable food and material supply. This manipulation came in the form of gathering, cutting, sowing, burning, hunting, and limited planting (Anderson 1988). Direct intense hand manipulations would have been limited by population size, distance from habitation sites, and length of occupation. More indirect manipulations, such as fire, would not have had such limits and would have only been limited by the susceptibility of fuels to burn. Fire was used to promote vegetation regeneration, for hunting, to capture insects for food, and for other activities (Blackburn and Anderson 1993; Anderson and

Moratto 1996; Lewis 1973; Bean and Lawton 1973). While the extent and scale of environmental impacts from Native American burning has been highly contested between anthropologists and natural scientists (Denevan 1992; Boyd 1999; Vale 2002; Whitlock and Knox, 2002; Lewis and Anderson, 2002; and Anderson, 2005), most scientists agree that within areas of habitation and traditional gathering Native Americans purposefully used fire and had a high degree of impacts. The loss of fire due to disruption of traditional tribal practices, plus subsequent fire suppression, has profoundly changed the forests. Euro-American contact and settlement in the 19th century ended much of the tribal manipulation of the area's ecosystems.

HISTORICAL BACKGROUND

The Gold Rush, Native Decline and Reservations

Discovery of gold in the southern Sierra Nevada during the early 1850s brought non-natives to the Greenhorn Mountains and the Kern River valley, south of the Monument. While the majority of miners went north or south of the Monument others used the trails passing through the mountains and caused development of the Jordan Trail, Camp Nelson, Ponderosa, and Mineral King. There were limited "diggings" in the White River area of the Monument.

Native Americans responded to the presence of non-Native miners, explorers, and settlers in a number of ways. The three most common strategies were: 1) they stayed in their traditional area and adapted as needed (somewhat maintaining a traditional lifestyle, or entered the local wage-labor economy working for Euro-Americans); 2) they fled to areas remote from Euro-American settlements; or 3) they resisted and fought for their territory. These choices were not mutually exclusive or necessarily independent from each other as individuals or tribal groups might do all three throughout their lifetimes or across generations.

The large influx of people into the San Joaquin Valley and Sierra Nevada foothills during the 1850s brought major armed conflicts, including the Mariposa Indian War and the Tule River War which was fought at Battle Mountain near Springville.

While the governor was sending militia to fight, punish, and bring Native Americans to reservations, President Millard Filmore, in 1851, sent three agents (O. M. Wozencraft, Redick McKee and George W. Barbour) to negotiate treaties with the California tribes. Subsequently, Congress authorized seven reservations of 25,000 acres each to be set aside. Throughout the 1850s Tribal members were moved from one reservation to another. First Fort Tejon was formed in 1853, then the Tule Farms/River Reservation (also known as Madden Farm) was established in 1856; the Fresno River Reservation was established in 1857. In 1861, both the Fresno and Tule River were combined and moved to the mountains where the Tule River Reservation exists today (Theodoratus Cultural Research 1984).

The shuffling and segregation of Native American people continued when President Ulysses S. Grant issued an executive order on January 9, 1873, establishing the Tule River Indian Reservation at its present location. The new reservation comprised about 48,000 acres but was almost doubled in size on October 3, 1873, when President Grant issued a second executive order resetting the northern boundary to the drainage between the Middle and North Forks of the Tule River. The expanded reservation did not last long when, in 1878, President Rutherford B. Hayes cut the reservation to its original size and returned all the additional land to the public domain (http://www.tulerivertribe-nsn.gov/history).

Emergence of Timber

By the mid-1850s, the demand for lumber in the valley brought loggers to the mountains. By 1865, James R. Hubbs had established the first sawmill in the Tule River basin. These earliest lumber mills were located in the lower elevations, investments were minor and the operations were small. "In addition, these mills were technologically primitive, compared with the mills soon to follow. These technologies were not restricted to a single type, but they did generally represent low-level stages within the evolution of the sawmill" (Brown and Elling 1981, p. 54). The first sawmills "were always built where they could recover the most wood with the least effort. So, as trees continued to be felled, the sawmill sites moved progressively farther up into the mountains (Larson 1985, p. 58). They usually focused on sugar pine or yellow pine and only logged those redwoods in their way.

The expansion of associated settlements into the mountains also took place with the establishment of California Hot Springs by the Witt brothers in 1883 (Muller 1990, p. 1), Pine Flat in 1883, Camp Nelson in 1886, and Springville in 1890.

Past management of what is today the Tule River Reservation Protection project is dominated by the private ownership and the Forest Service with the influence of Tule River tribal practices that borders the project area.

Mining

The Tobias project area is adjacent to the northern extent of the Greenhorn Mining District. Mining in the Greenhorn Mountains was spurred on by the discovery of gold on the Kern River in 1854 (Kelly 2013:3). By December of that same year, gold was discovered in Greenhorn Gulch and by the next year (1855) mining in the Greenhorns was well established (Kelly 2013: 4).

The influence of mining within the project area is represented by the Tip Top Mine (site 05135300310). According to New World Consultants who contacted the claim holder in 1993, mining activities at this site dated to as early as the 1920s (Graves et al. 1993:1). A GLO land patent search reveals a patent was issued to the State of California in 1879 for the section where the Tip Top Mine is located.

Tribal and Native Interests

Affected Environment

Tribal and Native American Interests

Native Americans and Alaska Natives are recognized as people with distinct cultures and traditional values. Historically, Native Americans have cared for and occupied lands that are currently being administered by the United States government. They have a special and unique legal and political relationship with the government of the United States as defined by history, treaties, statutes, executive orders, court decisions, and the U.S. Constitution. Tribal governments have jurisdictional powers that are frequently separate and equal to those of state and local governments. The policy of the U.S. Government is to support Native American cultural and political integrity, emphasizing self-determination and government-to-government relationships. This support comes from implementing and following laws aimed at protecting tribal rights and religious beliefs. The American Indian Religious Freedom Act 1978, the Archeological Resources Protection Act 1979, the National Historic Preservation Act 1996, Executive Order 13175 on Tribal Consultation, and others all charge the federal government with protecting areas within public lands that are sacred to native peoples. In addition there are many Forest Service policies, including but not limited to Forest Service Manual 1500, Chapter 1560, the Traditional Gathering Policy, to help and assist with tribal relations between the Forest Service and tribal communities.

There are many rights and privileges associated with treaties, executive orders, and other agreements, such as grazing, hunting, subsistence gathering, and access to and gathering of national forest resources. In addition, land and resources hold a special and unique meaning in the spiritual and everyday lifeways of many Native Americans.

The Sequoia National Forest remains committed to cultivating good relationships with Native American tribes and Native American groups. National Forest System lands and resources represent significant cultural and economic values to Native Americans. Forest Supervisors have the responsibility to maintain a government-to-government relationship with federally-recognized Indian tribes. They are to ensure that forest programs and activities honor Indian treaty rights and executive orders, and fulfill trust responsibilities, as those responsibilities apply to National Forest System lands. Treaties, statutes, and executive orders often reserve off-reservation rights and address traditional interests relative to the use of federal lands.

The Forest Supervisor also administers programs and activities to address and be sensitive to traditional native religious beliefs and practices and provide research, transfer of technology and technical assistance to tribal governments. The Sequoia also confers with non-federally recognized tribes, organizations and individuals.

Currently, the Sequoia has one agreement in place with Native American tribes concerning Sequoia National Forest Protocol for the Inadvertent Discovery and Identification of Native American Human Remains, Funerary Objects, Sacred Objects and Objects of Cultural Patrimony, that applies equally to federally and non-federally recognized tribes.

In 2011 the forest entered into a *Memorandum of Understanding between the Tule River Indian Tribe and the USDA, Forest Service, Pacific Southwest Region, Sequoia National Forest (FS Agreement No. 11-MU-11051352-039)*, that formally recognized the mutual interest in reducing the threat of wildfire spreading to or from National Forest System lands and Reservation Lands.

The Western Divide Ranger District borders over one-half of the entire Tule River Reservation, and approximately 9,000 acres of the upper portion of the South Fork Tule River, to which the Tule River Tribe has water rights under the Winters Doctrine. The Winters Doctrine established that when the federal government created Indian reservations, water rights were reserved in sufficient quantity to meet the purposes for which the reservation was established. Water rights affect over 1,700 residents of the Tule River Indian Reservation.

Contemporary uses or concerns have centered on the protection of the Reservation through the reduction of the threat of wildfire spreading to or from National Forest System lands and Reservation lands; and the protection of and access to forest resources of cultural or traditional importance and areas with special or sacred values, often the locales of ceremonial activities. These include access and use of Forest Service roads that access reservation land, and protection of the Tule River watershed.

The Tule River Indian Tribe has a deep emotional, symbolic, and spiritual meanings for those areas that are their traditional lands, including those lands that are publicly owned and managed by Sequoia National Forest. In a general view, these perceptions and meanings influence their current lifestyles, environment, and quality of life (McAvoy and others 2001). Researchers also have noted that the dominant society's (in this case, Anglo-Hispanic) sense of place often conflicts and competes with the minority people's (Native Americans) sense of place, resulting in different realities or "contested terrain" that present challenges for public land management agencies (McAvoy and others 2001).

The Sequoia National Forest conducted tribal consultation with both federally recognized and unrecognized tribes to determine effects to Tribal and Native American interests. Both formal consultation with government to government presentation from the Western Divide District Ranger and the Tule River Indian Tribal Chair and Council took place and informal consultation with members of the Tule River Indian Tribe natural resources department and elders and also tribal individual with knowledge or interest in the area from the Tule River Indian Tribe and the *Tubatulabal* groups.

Information was provided to Native American interested parties at the Sequoia's Quarterly Tribal Forums on December 11, 2013, March 19, 2014, July 1, 2015, and December 1, 2015.

The Sequoia presented at the Tule River Indian Council meetings on July 9, 2014, and December 3, 2014, provided another presentation at the Tule River Elders on July 8, 2015, and at an IDT meeting with the Tule River Tribal representatives on February 2, 2016.

From Tobias specific meetings and issues expressed during the Giant Sequoia National Monument Plan and similar project meetings with Tribes four main issues

- Access for traditional uses, hunting, gathering and ceremonies and road closures.
- Fire protection for tribal lands and traditional lands
- Potential gathering and hunting areas
- Protection of archaeological sites

TRIBAL AND NATIVE AMERICAN INTERESTS - ASSUMPTIONS

Applicable laws, policy, directions, and regulations provide the management direction for tribal relations and issues. Forest Service activities and special use authorizations will comply with the Forest Plan.

The following assumptions will apply in the assessment of the environmental consequences of the alternatives:

- Access for traditional uses, hunting, gathering and ceremonies and road closures.
- Activities that reduce the potential for large scale fire to enter the Reservation have the greatest potential to benefit the tribe.
- Potential gathering and hunting areas.
- Protection of archaeological sites.

FIRE AND FUELS

AFFECTED ENVIRONMENT

Like most of California, the project area is dry during the summer because the Pacific high deflects storms tracks far to the north. Desert and mountain areas of California may occasionally receive summertime precipitation as moist air drifts northward from the Gulf of Mexico or the Gulf of California. This summertime monsoonal pattern may sporadically bring thunderstorms with locally intense downpours and lightning to the Tobias project area.

The highest fire danger occurs July through September which coincides with the strength of the Pacific high. Starting in the fall, the Pacific high decreases and moves further south allowing the jet stream to bring Aleutian storms to the southern Sierra Nevada range. The end of fire season is based on timing of these storm systems which usually arrive in November, but can vary year to year. Annual precipitation amounts range from 12 to 52 inches with an average of 28 inches. The majority of the precipitation occurs during the winter months and is often in the form of snow. The project area ranges from 5,200 feet to over 8,250 feet.

For the fire behavior analysis of this report, Fire Family Plus software program was used to determine historical fuel and weather conditions at the 90th percentile conditions specific to the analysis area. The 97th percentile conditions were also modeled to demonstrate more severe conditions, but they are not used in this report. The Johnsondale remote automatic weather station (RAWS 044707) was selected as a representative station because of its close proximity and similar elevation to the project area. For the purposes of defining a historical fire season, weather records are bounded by May 1 and October 31. Environmental data (table X), specifically weather parameters and fuel moistures, were developed using these historical weather records from May 1st through October 31st over 20 years (1994-2013) to evaluate conditions conducive to fire spread.

Table 13. Weather /fuel moisture analysis, Johnsondale RAWS (May 1 –Oct 31)

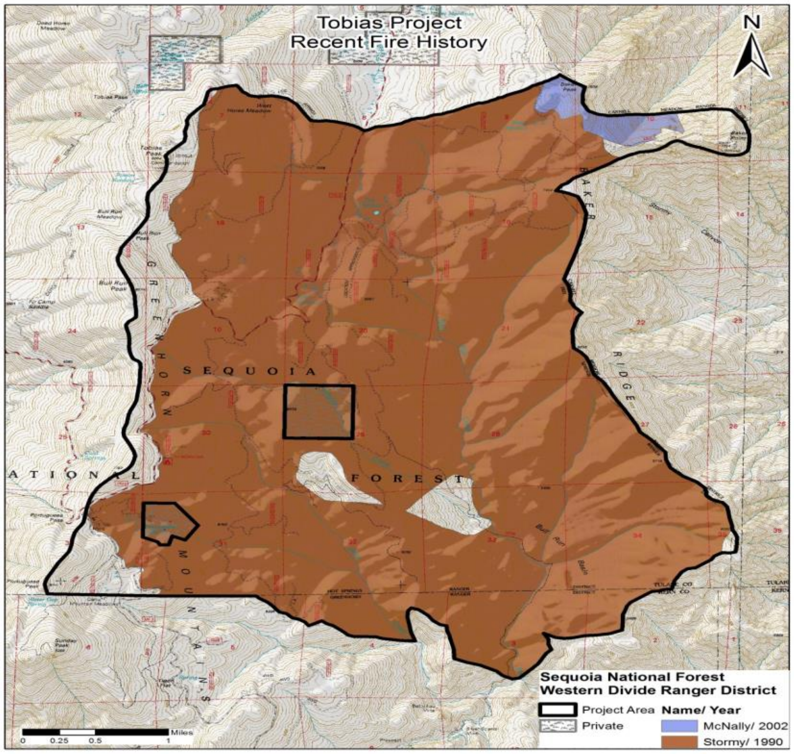
	1 Hour (%)	10 Hour (%)	100 Hour (%)	1000 Hour (%)	Duff (%)
90th Percentile	2.15	3.51	7.91	8.91	58.47
97th Percentile	1.38	2.72	6.89	8.27	26.27
	RH (%)	**Temp (F)**	**Winds (mph)**	**Woody Fuels (%)**	**Herb (%)**
90th Percentile	12	92	9	64.14	2.25
97th Percentile	8	95	11	60	1.5

FIRE HISTORY

Prior to the Stormy Fire in August of 1990, the project area lacked any recorded fire history. The Stormy Fire burned approximately 23,600 acres of the Sequoia National Forest and intermingled private land holdings. Ninety percent or 9,913 acres of the Tobias project area burned in the Stormy Fire. Post fire salvage logging and replanting occurred in areas that burned at higher severities.

The 150,670 acre McNally fire in 2002 only burned a small 162 acre portion of the project area near Baker Peak. The project area lacks any appreciable fire since 2002 except for prescribed burning which occurred between 1998-2002 following Stormy Fire salvage logging activities.

Figure 10. Fire history in the Tobias Project area.



FUELS AND FUEL MODELS

Fuel conditions in the Tobias project area have been shaped by both fire and the lack of fire. Suppression efforts in the last century have modified the structure of mixed-conifer forests of the southern Sierra Nevada (Parsons and DeBenedetti 1979, Bonnicksen and Stone 1982). This is the case before the 1990 Stormy fire and fuels have been building for the last 25 years since. Areas within the project area that experienced a stand replacing crown fire during the Stormy Fire are brush fields mixed with both planted and natural tree regeneration. Trees that were planted after the Stormy fire are either too closely spaced or have be encroached upon by brush. Areas that didn't burn or burned at lower intensities vary in composition depending on aspect and elevation. The project area is located on the east-side of the Greenhorn Mountains in the Bull Run Drainage from 5,200 feet to over 8,250 feet. Plant communities include Chaparral, Canyon Live Oak Woodland, Black Oak Woodland, Mountain Meadow, Rock Outcrop, Lower Mixed Conifer-Pine, Mixed Conifer-White Fir, Mixed Fir Forest, Montane Brushfield, and Red Fir Forest.

Figure 11. Area within the Tobias project with a high brush component.

Figures 12 and 13. Fuel conditions in the Tobias project area.

The Tobias project area has 21 different Standard Fire Behavior Fuel Models identified in in the Sequoia National Forest GIS fuels layer. The description of these models can be found in Scott and

Burgan 2005, A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model. The fuel models identified in the Tobias project area range from non burnable (NB9, 99) to very high load broadleaf litter (TL9, 189) with 2,661 acres comprised of moderate load dry climate grass-shrub (GS2, 122).

Figure 14. Fuel Model Map of Tobias Project Area

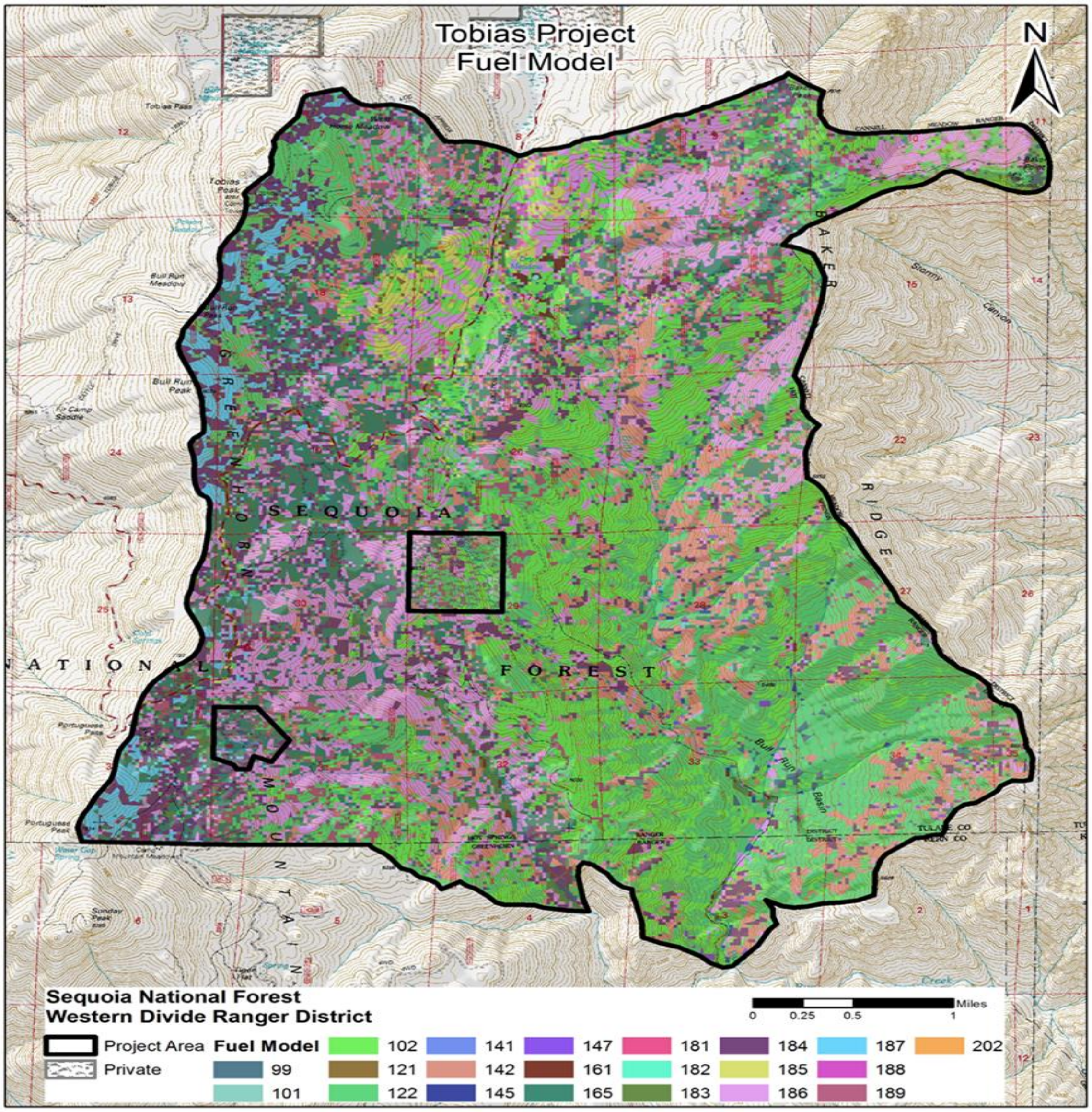


Table 14. Fuel Models within the project area.

40 Fuel Models within the project area	Description	Crosswalk to 13 Standard Fuel Models	Acres within project area
99 (NB9)	Bare Ground	N/A	87
GR1 (101)	Short, sparse dry climate grass	1	19
GR2 (102)	Low load, dry climate grass	1,2	1,877
GS1 (121)	Low load, dry climate grass-shrub	2	30
GS2 (122)	Moderate load, dry climate grass-shrub	2	2,661
SH1 (141)	Low load dry climate shrub	5,6	<1
SH2 (142)	Moderate load dry climate shrub	5,6	1,071
SH5 (145)	High load, humid climate grass-shrub	4,5	10
SH7 (147)	Very high load, dry climate shrub	4,5	37
TU1 (161)	Low load dry climate timber-grass-shrub	8,10	24
TU5 (165)	Very high load, dry climate timber-shrub	10	1,311
TL1 (181)	Low load compact conifer litter	8	1
TL2 (182)	Low load broadleaf litter	9	<1
TL3 (183)	Moderate load conifer litter	8	111
TL4 (184)	Small downed logs	8	992
TL5 (185)	High load conifer litter	8	139
TL6 (186)	Moderate load broadleaf litter	9	2,062
TL7 (187)	Large downed logs	8	267
TL8 (188)	Long-needle litter	9	33
TL9 (189)	Very high load broadleaf litter	9	285
SB2 (202)	Moderate load activity fuel or low load blowdown	11,12,13	1

***GR = Grass, GS =Grass/Shrub, SH =Shrub, TU = Timber-Understory, TL = Timber Litter, SB = Slash**

Fire Return Interval / Fire Return Interval Departure

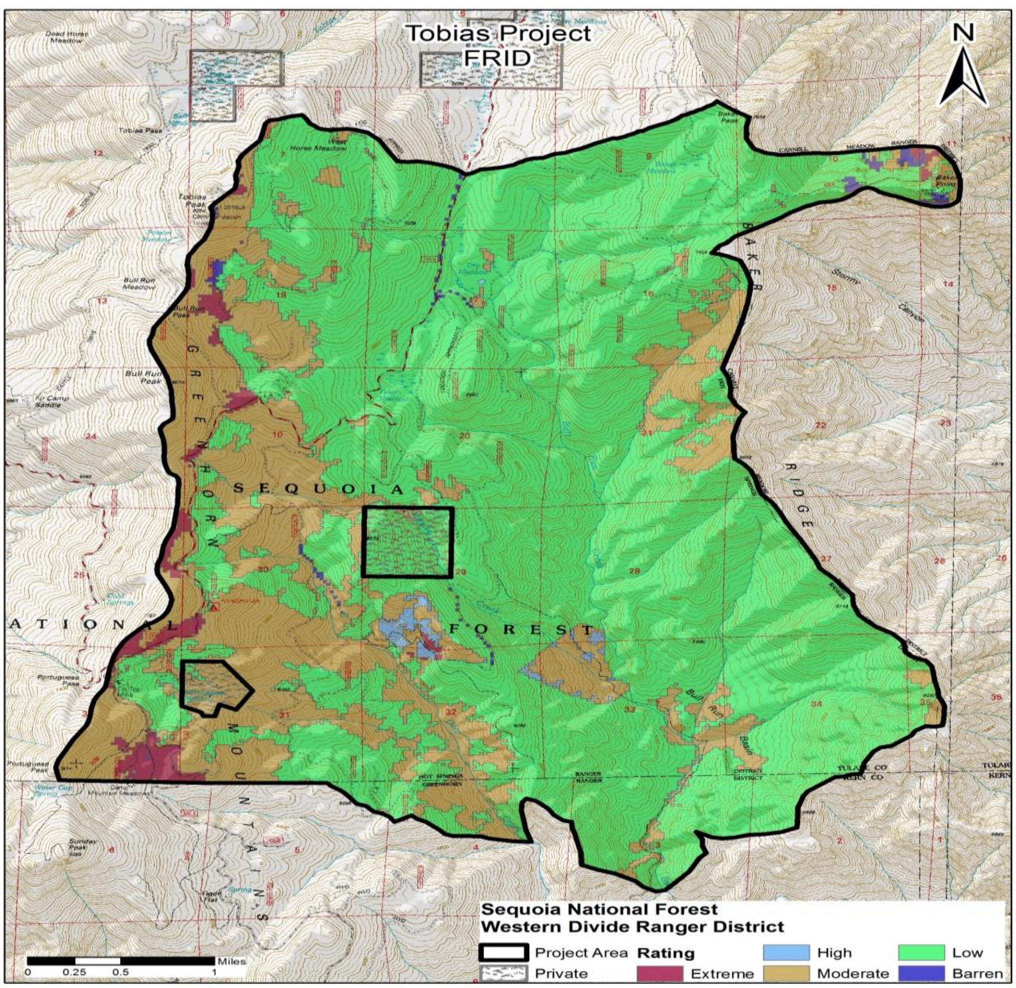
Fire return interval describes how often fires occurred historically (pre-European settlement) in a particular location and vegetation type. Fire Return Interval Departure (FRID) is a temporal attribute of the fire regime that is measured by determining when fire occurred last on each of the acres in the area and comparing this with the fire return interval for the locale and vegetation type. Prior to Euro-American settlement, fire in mixed conifer forest of the Sierra Nevada occurred at intervals between eight and 25 years. Fire Return Interval Departure (FRID) is an indicator of how close the area is to the historic fire regime.

The fire return interval for a given vegetation type can be used in conjunction with fire history maps to determine which areas have missed natural fires. The 1990 Stormy Fire reset approximately 90 percent of the project area to a low FRID class.

Table 15. Fire Return Interval Departures (FRID) and associated acres in the Tobias project area.

Fire Return Interval Departures	Class	Acres in project area
5 - 17 intervals missed	Extreme	181
2 - 4.9 intervals missed	High	56
0 – 1.9 intervals missed	Moderate	2,682
< 0 intervals missed	Low	8,155
Barren	Rock/water	47

Figure 15. Fire Return Interval Departure Map for Tobias Project Area



VEGETATION/SILVICULTURE

AFFECTED ENVIRONMENT

This section of the report addresses current and desired forest stand conditions in the project area and the silvicultural treatments proposed to achieve the land management objectives. The British Columbia Ministry of Forests define silviculture as “the art and science of controlling the establishment, growth, composition, and quality of forest vegetation for the full range of forest resource objectives“(British Columbia Ministry of Forests, 2015). The American Society of Foresters define silviculture as “the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis” (Helms, 1998). To assess current conditions and to model the effects of possible actions, the project area was stratified into California wildlife habitat relationship (CWHR) cover types. These cover types are separated by species, size, and density of vegetation. Data was collected on trees, snags, woody brush, soft plants, dead and down logs, and fuel loading. This data was modeled with the forest vegetation simulator (FVS).

CURRENT FOREST CONDITIONS

The site quality in the project area is good. The immature stands are overall a little better quality growing sites, because the Stormy fire that created them came up from the chaparral following the drainage bottoms and mostly left upper slopes and ridge tops lightly burned or unburned. This EIS addresses how the different alternatives impact forest vegetation, as measured by stand density (basal area or stand density index), stand composition (trees per acre), and stand structure.

In the project area, there are 3,300 acres of immature stands that were burned with stand replacing fire in the 1990 Stormy fire and have either regenerated naturally or been planted. These stands average 609 trees per acre and have an average stand density index (SDI) of 254. The average diameter of trees in these stands is 5.4 inches and the average top height is 31 feet. There are 2,000 acres of mature stands that either did not burn or burned with a mixed severity fire. These stands average 400 trees per acre and have an average SDI of 347. The average diameter of these stands is 12 inches and the average top height is 68 feet.

STAND HISTORIES AND DEVELOPMENT

Vegetation in the project area was affected by grazing by 1880. Fire suppression started when Native American burning was stopped in the 1860’s and accelerated after the creation of the National Forest in the 1900’s. Logging started in the 1930’s. One of the cumulative effects of grazing, fire suppression, and logging was development of denser stands of trees dominated by shade tolerant species. The species mix for conifer trees 10 inches and larger in a 1929 timber cruise was 27% ponderosa and Jeffrey pine, 16% sugar pine, 46% white fir, 9% incense cedar, and 2% other species (USDA Forest Service, 1994).

Treatments of vegetation are to be done on approximately 4,500 acres. Stands burned over in the 1990 and subsequently either planted or regenerated are 3,300 of these acres. These stands have a very high brush component, mostly whitethorn and manzanita. This non-riparian vegetation has dominated much of the riparian areas for the last 25 years. Most of these stands have a few larger trees that survived the fire. These survivors are not evenly distributed, but are clumped. The rest of the treatment area is in mature stands that were logged by partial cutting sometime in the past 80 to 25 years. The disturbances associated with this logging produced flushes of regeneration. This regeneration has developed into a dense shade tolerant understory of white fir and incense cedar.

There are 1,750 acres of mature stands of trees with no previous history of logging that burned with mixed severity in the Stormy Fire. These stands are currently being managed by managing naturally occurring fires for resource benefits. That will continue as is.

Figure 16. Stand in Bull Run Basin that survived the Stormy Fire

DESIRED CONDITIONS

The Sequoia National Forest Land and Resource Management Plan (LRMP 1988), as amended by the Sierra Nevada Forest Plan Amendment (SNFPA ROD 2004) provides direction for designing and developing fuels and vegetation management projects in the Sequoia National Forest. In designing the strategic layout of treatments, managers ensure that treatment area patterns and prescriptions are consistent with or moving toward desired conditions, management intents, and management objectives for relevant land allocations. Desired conditions are goals, not standards. Short-term deviations or shortfalls in desired conditions may be acceptable to meet long-term goals, as opposed to standards that must be met.

The Tobias project proposes to treat vegetation to achieve several goals and objectives including: long term restoration of pine and other shade intolerant species, reduction of density levels, improved vertical and horizontal heterogeneity, improvement of forest stand conditions to provide greater resilience to remaining vegetation, and fuels reduction. Land designations to be treated are from the 1988 Sequoia National Forest Land and Resource Management Plan (LRMP, LMP), following guidance set forth in the 2004 Sierra Nevada Forest Plan Amendment Record of Decision (2004 SNFPA ROD, 2004 ROD). The objective is not to eliminate all tree mortality, or to maximize stand growth, but to change fire behavior on a stand level, which would reduce the risk of landscape level, high severity, and high intensity fire. Forests stands would exhibit greater degrees of resilience and growing conditions would be less crowded improving overall forest health.

These measurements are correlated to appropriate stocking levels, and stand conditions to maintain stand growth and health, including resistance to epidemic levels of insects and disease.

Figure 17. Heterogeneous uneven-aged stand with about 70% canopy cover

TREATMENTS

The treatments described below are developed to meet the project purpose and need and be consistent with relevant management direction.

Treatment for the immature stands will be to thin out the small trees and brush. This will be done by both hand and mechanical treatment. Slash from the thinning and the existing woody debris up to 8 inches diameter piled and burned. During this burning the fire will be allowed to creep around between piles. Riparian vegetation will not be lit, but the fire will be allowed to back into streamside management zones. Where trees and brush are thinned mechanically with a masticator, this piling and burning will not be done.

Treatment for the mature stands will be to thin out the small and medium sized trees and brush by a combination of hand and mechanical methods. Slash and existing woody debris up to 8 inches diameter will be piled and burned as described above. The medium sized trees are trees no less than 10 and less than 30 inches in diameter. These trees will be cut first. Their felling will cause some amount of damage to the small trees, so the felling should take place before the selection of cut and leave trees for small trees is done.

Silvicultural treatments would create conditions for shade intolerant species (pine, oak) to become more numerous over time, in an effort to improve fire resilience across the landscape. Fire resilience is defined as the ability for live vegetation to survive fire events. In the event that vegetation is killed, fire effects will be low enough such that the site (primarily soils) can sustain live vegetation. Shade intolerant pine species generally have higher survival rates in fire events due to increased bark thickness which can reduce bole damage. Bole damage in wildland fire events is a significant contributor to post fire mortality. Some shade intolerant hardwoods also have higher fire survival rates due to thick bark. The hardwoods have the ability to resprout after fire damage.

Treatments would reduce tree density, alter stand composition and stand structure, and improve the growth of trees, forest stands, and the vegetation in the project area. Risk of epidemic insect and disease events would be lowered. Tree and forest health conditions also contribute significantly to the fire risk; therefore silvicultural treatments that improve forest health and lower risk of insect and disease outbreaks would contribute to reducing fire risk and behavior. For example, in certain stand structure conditions, the amount of vegetation mortality from insect/disease conditions, can increase both crown fire potential and contribute to increased fuel levels now and over time. Thinning forest stands to specific standards contributes to maintaining forest health while achieving fire behavior objectives. Mechanical thinning operations have the ability to effectively (both economically and ecologically) remove trees of varying sizes while managing the reduction of canopy cover, and residual fuel levels.

Table 16. Forecast of the development of mature stands after the proposed action

Year	Trees per acre	Average diameter (Inches dbh)	Top height (feet)	Stand density index	Canopy cover (%)
2010 exam	400	12	68	347	68
Before treatment	390	12	73	363	70
10 years after treatment	114	17	80	241	54
30 years after treatment	108	20	103	298	65
60 years after treatment	95	24	125	361	76

Table 17. Forecast of the development of immature stands after the proposed action

Year	Trees per acre	Average diameter in inches (dbh)	Top height in feet	Stand density index	Canopy cover in %
2010 exam	610	5	31	254	100
Before treatment	595	6	38	297	100
10 years after treatment	172	9	51	131	67
30 years after treatment	160	14	87	232	87
60 years after treatment	131	21	126	335	100

TRANSPORTATION

AFFECTED ENVIRONMENT

The arterial, collector, and local roads in the Tobias Project are suitable for proposed operations access and product hauling. Arterial or major collector roads are in good condition with highest priority for seasonal maintenance. Secondary roads are maintained for high clearance vehicles. Road maintenance funding is limited with primary roads receiving highest maintenance priority.

The project area has about 6 miles of maintenance level 4 roads, 7 miles of maintenance level 3, open system roads suitable for passenger car travel, 31 miles of maintenance level 2 roads suitable for high clearance vehicles and 5 miles of maintenance level 1 closed roads. Access for resource management includes consideration for soil and water protection, public safety, efficiency of access, and effects on wildlife and other resources.

The existing road system provides access for fire protection, administration, recreation, timber harvest, firewood gathering and other forest products removal, fuels management, mineral extraction, private land access and other forest management activities. About 11.29 miles of system roads, not needed for foreseeable future resource management, are planned to be decommissioned. No other road management or travel management changes are proposed on this project.

Table 18. Existing National Forest system roads within the project area

Road Number	Road Name	Miles	ML[a]	Surface	Function
23S16	Sugarloaf	5.89	4	bituminous	arterial
24S02	Baker Point	2.6	2	native	local
24S03	Schultz	1.50	2	native	local
24S08	Tobias Peak Lookout	0.9	2	native	local
24S09	Panorama	0.33	2	native	local
24S10	Portuguese Meadow	0.9	2	native	local
24S15	Portuguese Meadow	7.33	3	Improved native	arterial
24S15A	Portuguese Meadow	0.5	1	native	local
24S24	Tobias Meadow	1.3	2	Improved native	local
24S24A	Tobias Meadow	0.60	1	native	local
24S25	McSwiney Bldvd	2.4	2	native	local
24S25A	Sunday Peak	0.30	1	native	local
24S25B	Sunday Peak	0.30	1	native	local
24S28	Tyler Meadow	0.4	2	native	local
24S34	Tyler Meadow	1.55	2	native	local
24S34A	Tyler Meadow	0.3	2	native	local
24S35	Schultz Creek	7.8	2	native	collector
24S35A	Schultz Creek	0.9	2	native	local
24S35C	Schultz Creek	1.6	2	native	local
24S37	South Dry Meadow	1.10	2	native	local
24S37A	South Dry Meadow	0.60	1	native	local
24S45	Stormy Canyon	0.47	2	native	Local
24S45A	Stormy Canyon	0.30	1	native	local
24S46	Deep Creek	1.20	1	native	local
24S46A	Deep Creep	0.46	2	native	local
24S50	Greenhorn Mountain	1.1	2	native	collector

Road Number	Road Name	Miles	ML[a]	Surface	Function
24S77	East Horse	0.8	2	native	local
24S80	Lower Dry Meadow	1.37	2	native	local
24S80A	Lower Dry Meadow	0.68	2	native	local
24S80B	Lower Dry Meadow	0.29	1	native	local
24S80C	Lower Dry Meadow	0.45	2	native	local
24S83	Upper Dry Meadow	1.36	2	native	local
24S83A	Upper Dry Meadow	0.76	1	native	local
25S37	Cave	0.60	2	native	local
25S37A	Cave	0.50	1	native	local
25S38A	Bull Run Basin	0.53	2	native	local

[a]ML – maintenance level

Road Maintenance Level Descriptions

- Maintenance level 1 roads are closed. Basic custodial maintenance is performed to protect adjacent resources and to protect the road for future management activities. Maintenance emphasis is to ensure drainage facilities are functioning.
- Maintenance level 2 roads are open for use by high clearance vehicles. Maintenance level 2 roads may not be suitable for passenger car travel.
- Maintenance level 3 roads are open and maintained for passenger car travel by a prudent driver, user comfort or conveniences are not priorities. Roads are typically low speed, single lane with turnouts and could have spot surfacing. Some roads may be fully surfaced with either native or processed material.
- Road Maintenance Level 4 roads provide a moderate degree of user comfort and convenience at moderate travel speeds.
- Road Maintenance Level 5 roads are designed to provide a high degree of user comfort and convenience. These roads are normally double-lane, paved facilities. Some may be aggregate surfaced and dust abated.

There is a backlog of maintenance work to be done on system roads in the project area. Existing deferred road maintenance needs and estimated costs are included in Appendix J.

SOILS RESOURCES

AFFECTED ENVIRONMENT

Soils in the proposed project area vary in their sensitivity to management from soil map unit to soil map unit. Soils with higher clay contents in combination with increased soil moisture have the highest potential for reduced soil porosity, soil compaction can occur down to 12 inches deep. Younger soils with less significant soil profile depths, commonly containing a shallow A horizon, are susceptible to the removal of the overlying thin A horizon. Soil disturbance is considered by any activity resulting in detrimental soil compaction or loss of organic matter beyond the thresholds identified in the soil quality standards, soil disturbance can also be termed as ground disturbing activities.

The geology beneath the soils consists primarily of granitic bedrock (Ross, 1986). The mineral composition of the regolith is more or less ubiquitous throughout the study area and includes minerals such as quartz, potassium-rich feldspars, plagioclase feldspars, and micas; however, the degree of weathering varies from residuum to whole rock. This weathering of uplifted granitic bedrock and concomitant geomorphic processes results in landscape evolution. These geomorphic processes, which primarily include mass wasting (debris flows, soil creep, rock falls and rock slides) and fluvial (sheetwash, rill erosion and channel erosion and/or deposition) result in the flux of unconsolidated material throughout the project area. Subsequently, time, slope, aspect and weathering are the likely driving factors for soil formation variability within the study area.

Concerns for soils in the project area include:

- There is a concern areas proposed for ground based harvest, specifically tractor skidding within stand 36, contain soils that are highly susceptible to a reduction of soil porosity caused by the compaction from heavy equipment operating when soils are too moist or wet.
- There is a concern that ground based harvest systems on slopes that are too steep or are on shallow soils will displace surface soil horizons that could result in accelerated erosion and/or reduce soil productivity. Steep ground, exceeding desired thresholds, proposed for treatments are found within stands16, 21-25, 29-31, 33, 34, 36 and 38. Stands with proposed treatments on units that may contain shallow soils include stands 8, 16, 17, 21-25, 27, 29-31, 33, 36-38 and 40.
- There is a concern prescribed fire and tractor piling will reduce soil cover and cause an increase in accelerated erosion that could result in a loss of soil productivity.
- There is a concern that mastication on steeper slopes, during increased levels of soil moisture could lead to a reduction in soil porosity, increased depth of incision into the subsurface soil profile and have increased amounts of accelerated erosion possibly occurring.
- There is a concern that significant amounts of soil disturbance proximal to the cable yarding landings could result in accelerated surface erosion, and long linear gouges beneath cables could result in removal of soil cover and surface soil horizons which may induce accelerated erosion and/or reduce soil productivity.
- There is a concern that prescribed burning and burning of slash piles could lead to nominal damage from soil heating, which could result in nitrogen loss, exposed mineral soil and the mortality of bacteria, mychorrhizae, seeds and fine-roots (Busse, Hubbert and Moghadaddas, 2014).
- There is a concern that the construction of new temporary roads will result in an increase in soil displacement, compaction and soil productivity.

Within the project area thirteen individual soil series and/or families can be found; Chaix, Chawanakee, Cieneba, Dome, Holland, Livermore, Monache variant, Nanny, Sirretta, Wind River, Woolstalf, Xerofluvents and Xerorthents. These thirteen soil series and/or families combine with rock outcrop to form thirteen soil map units. See Figure 1 Tobias Ecological Restoration Soils Map for location and extent of soil map units. Soil families in the project area where proposed treatments will occur include; Cieneba, Chaix, Chawanakee, Dome, Holland, Monache variant, Nanny, Sirretta, Wind River and Woolstalf. These soils will be described in more detail. Soils where treatments are not proposed will not be described any further.

See Table 2 in the Soils Report for a complete list of the soil series/families and their soil profile characteristics including taxonomy, temperature regime (based on mean annual soil temperature, mean summer temperature, and the difference between summer and winter temperatures, all at 50 cm depth), texture, depth, horizonation, hydrologic group (ability of soil to accept and transmit water down through the profile; group 'A' having the highest rate of water transmission and group 'D' having the slowest rate), and drainage class (rate at which water is removed from the soil). See Table 3 in the Soils Report for a list of soil map units, soil map unit names, unit acres within project area, Erosion Hazard Risk (EHR), Maximum Erosion Hazard (MEH), soil sensitivity, soil compaction hazard, associated stand numbers and proposed treatments within map units.

GEOLOGY AND SLOPE STABILITY

AFFECTED ENVIRONMENT

EXISTING CONDITION

The following information addresses the affected environment or existing condition of the geologic resource and slope stability conditions for the proposed Tobias Ecological Restoration Project area.

SLOPE STABILITY

Concerns for the instability of the temporary roads:

1) There is a concern that the construction of proposed temporary roads could result in unstable conditions and significant amounts of soil material could erode and deposit sediment into stream systems below the temporary roads.

2) There is a concern that cut bank and/or fill failures could occur along the proposed road template and result in damage to the road.

The area where temporary roads are being proposed are located on the east facing slopes of the Greenhorn Mountains, between Portuguese Peak on the south end of the project area and Tobias Peak on the north end of the project area. The boundary of the Giant Sequoia National Monument is located on the ridge top of this mountain to the west of the proposed temporary roads and landings.

GEOLOGY

The geology in the area is underlain with igneous intrusive bedrock (Ross, 1986) (see Figure 1). The Tonalite of Dunlap Meadow (Kdm1) is located on the north portion of the area where the temporary roads are proposed and the Granite of Portuguese Pass is located on the south portion of the area where the temporary roads are located. The slopes where the proposed temporary roads and landings are located vary from gentle slopes, where they begin off the existing Forest System roads to steeper slopes up to 60%. These east facing slopes of the Greenhorn Mountains have formed from differential weathering processes and are located on mountain sides and ridges. These mountain side slopes are mostly straight planer or convex. There are a few areas where concave slopes were located. Channel systems are located lower on the slopes below the existing forest road system. There are no channels that are proposed to be crossed by the temporary roads.

Soils

Soils in the area where temporary roads are proposed are mapped as soil map unit 620 (See Figure 2). This unit is 35 percent Chaix family soils, 35 percent Rock outcrop and 25 percent Chawanakee family soils (Hanes, 1996). The average depth to the restrictive paralithic bedrock is 25 inches for the Chaix family soil and 10 inches for the Chawanakee family. The Chaix soil has a surface soil that is a sandy loam and a subsoil that is a coarse sandy loam. The Chawanakee soil has a surface soil that is a coarse sandy loam. Both of these soils are on weathered bedrock that varies from moderately weathered to highly weathered. Highly weathered, saprolitic bedrock was observed in many areas along the existing road cut below the proposed temporary roads. The unified soil classification of soils in this area consist of silty sands (SM). These soils are considered non-plastic and cohesionless with an angle of internal friction of 34 degrees and an average bulk density of 137 gm/cm^3.

Slope Stability Conditions

Slope stability conditions in the project area are mostly stable. Slope stability conditions in the area where the proposed temporary roads are proposed vary from stable to unstable. The unstable areas are located on the steeper slopes that exceed 60% where precipitous slopes were observed and rock fall is evident. There were some observed areas of rock fall located in close proximity of the proposed temporary roads. There was no evidence of landslides on these slopes. There is one area along the Sugarloaf Road where a road cut failure occurred years ago. This road cut was constructed in deeply weather rock and failed years after construction of the road. Geotechnical stabilization measures were employed to stabilize the cut and repair the road and slope damage.

The proposed temporary roads are located on moderately steep to steep slopes and have varying degrees of slope stability. The routes were reviewed and noted on slope gradient, soil and rock outcrop exposure, fracture spacing, and construction difficulty.

Watershed

Affected Environment

There are two 6^{th} field HUC[1] watersheds affected by the Project. Table 20 consists of the watersheds and their associated stream class, beneficial uses, and approximate acres in the watershed basin. Figure 18 follows after Table 20 displaying a map of the subwatersheds affected by the project. Following Figure 18 is a description of each 7^{th} field HUC within the project area regarding miles of streams, roads, and any recreational uses.

Subwatersheds potentially affected by the Tobias Project range from Class I to Class IV streams. Approximately 67 miles of stream with intermittent flow (38 miles) being the majority and the remaining perennial. The terrain overall is steep creating moderate to high gradient stream channels. The stream condition inventory (SCI) survey along Bull Run Creek is within their range of natural variability and is located in a stable sensitive riparian ecotype, which allows for detection of changes in key features to the overall stability and health of the streams. Cumulative watershed effects analysis for existing conditions concludes no subwatersheds over threshold of concern (TOC). TOC ranges from approximately 0% used to 84.5% used.

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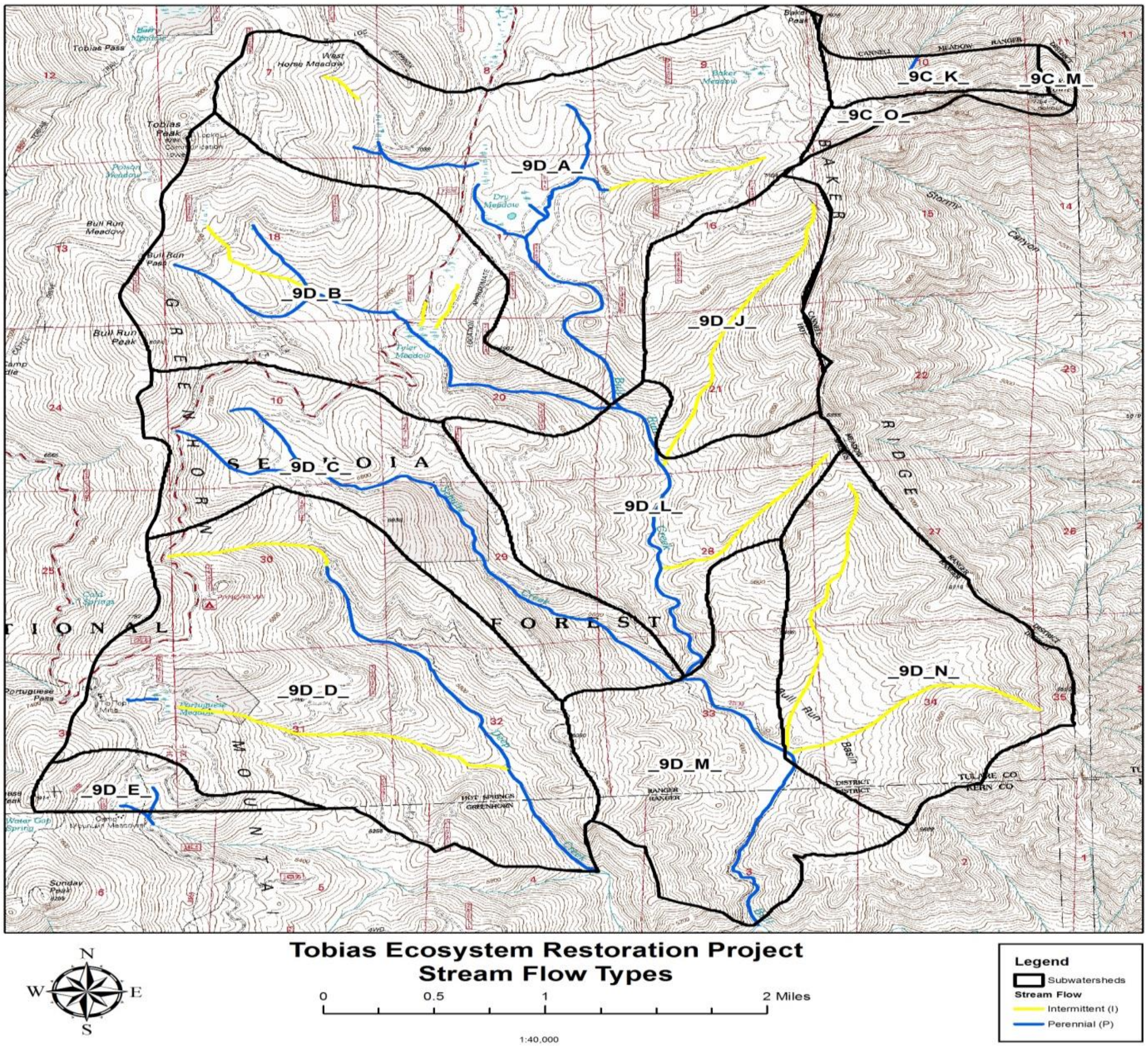
[1] Hydrologic Unit Codes (HUCs) were designated by the United States Geological Service (USGS) in conjunction with other agency input.

Table 20. Affected Watersheds in the Upper Tule River Basin, Tulare-Buena Vista Lake Hydrologic Province

5th Field HUC (name/#)	6th Field HUC (name/#)	7th Field HUC Name/#	Stream Class	Beneficial Uses (Existing)	Acres
Middle Kern River 1803000106	Kern River / Corral Creek 180300010603	South Fork Ant Canyon (9CK)	I	Fresh	875
		Unnamed (9CM)	I	Fresh	1132
		Stormy Canyon (9CO)	I	Rec2, Wild, Fresh	2974
	Bull Run Basin 180300010604	Dry Meadow Creek (9DA)	I	Rec2, Wild, Fresh	2041
		Tyler Meadow Creek (9DB)	I	Rec1, Rec2, Cold, Wild, Spawn, Fresh	1433
		Shultz Creek (9DC)	I	Rec1, Rec 2, Cold, Wild, Spawn, Fresh	1153
		Deep Creek (9DD)	I	Rec1, Rec2, Cold, Wild, Spawn, Fresh	2180
		Girl Scout Camp (9DE)	I	Fresh	1355
		Baker Creek (9DJ)	I	Fresh	699
		Bull Run (9DL)	i	Rec1, Rec2, Cold, Wild, Spawn, Fresh	961
		South Bull Run Creek (9DM)	I	Rec1, Rec2, Cold, Wild, Spawn, Fresh	1418
		Unnamed (9DN)	I	Fresh	1188

Figure 18. Project map displaying the project boundary, subwatershed boundaries, and stream flow types



Not every subwatershed within the two HUC 6 watersheds is part of the Tobias Project. There are 13 subwatersheds total that could be affected by the project. Table 21 displays each subwatershed's sensitivity, miles of stream, and size in acres.

Table 21. HUC 7 Subwatershed information within the Kern River HUC 6 Watersheds

Subwatershed Number	Subwatershed Name	Subwatershed Sensitivity[2]	Miles of Stream[3]	Acres[4]
9CK	South Fork Ant Canyon	None	1.92	875
9CM	Unnamed	None	9.94	1132
9CO	Stormy Canyon	None	14.56	2974
9DA	Dry Meadow Creek	Low	4.63	2041
9DB	Tyler Meadow Creek	Moderate	1.04	1433
9DC	Shultz Creek	Moderate	3.11	1153
9DD	Deep Creek	Moderate	4.46	2180
9DE	Girl Scout Camp	None	2.76	1355
9DJ	Baker Creek	None	1.81	699
9DL	Bull Run	Moderate	3.03	961
9DM	South Bull Run Creek	Moderate	2.89	1418
9DN	Unnamed	None	3.09	1188

The project area encompasses only a portion of the total acres per subwatershed. Table 3 below shows the maximum acres potentially affected by the project. A detailed description of the channel conditions within in each subwatershed is discussed after Table 3. Subwatersheds 9CK, 9DG, and 9DN are within the project area, but will not have any proposed management actions occurring resulting in 0 percent affected.

Table 22. Percent of each subwatershed potentially affected by the project based on acreage

Subwatershed Number	Subwatershed Name	Subwatershed Acres	Project Acres	Percent Affected
9CK	South Fork Ant Canyon	875	0	0
9CM	Unnamed	1132	1	0
9CO	Stormy Canyon	2974	8	0
9DA	Dry Meadow Creek	2041	1710	84
9DB	Tyler Meadow Creek	1433	1299	91
9DC	Shultz Creek	1153	684	59
9DD	Deep Creek	2180	815	37
9DE	Girl Scout Camp	1355	204	15
9DJ	Baker Creek	699	86	12
9DL	Bull Run	961	98	10
9DM	South Bull Run Creek	1418	1	0
9DN	Unnamed	1188	0	0

[2] Determined by the Sequoia National Forest's Cumulative Water Effects model using data collected from soil, topography, climate, geology, vegetation, and channel stability surveys.
[3] Miles are approximate.
[4] Acres are approximate.

EXISTING CONDITION

Kern River / Corral Creek Watershed

South Fork Ant Canyon (9CK)

South Fork Any Canyon flows north, near Baker Point, towards Ant Canyon. Approximately 1.92 miles of stream reside within the subwatershed and all of it is perennial. Half of trail 32E37 resides at the top of the subwatershed and there are no roads.

South Fork Ant Canyon subwatershed has not been surveyed due to limited access, dense vegetation, and steep terrain. Based on aerial photography and topographic maps, the stream channel is an entrenched, high gradient, naturally stable to unstable, A channel type. It remains as an A channel throughout the subwatershed.

Unnamed (9CM)

Unnamed subwatershed flows directly into the Kern River near Gold Ledge Campground. Approximately 9.94 miles of stream reside within the subwatershed. The 1.85 miles of perennial flow is located at the confluence with the Kern River. The remaining 8.09 miles of stream is intermittent. No roads or trails exist within the subwatershed.

Unnamed subwatershed has not been surveyed due to no access, dense vegetation, and steep terrain. Based on aerial photos and topographic maps, the headwater channels begin as an entrenched, very high gradient, naturally stable, A channel type. Once the headwater channels confluence and flow into section 12, the channel changes to a moderately entrenched, high gradient, naturally stable, boulder dominated with some bedrock control, B2a channel type. The B2a channel type continues for the rest of the subwatershed.

Stormy Canyon (9CO)

Stormy Canyon subwatershed flows directly into the Kern River about a mile south of Hospital Campground. Approximately 14.56 miles of stream reside within the subwatershed. The perennial portion consists of 4.5 miles and the other 10.06 miles is intermittent. No roads or trails exist within the subwatershed.

Stormy Canyon subwatershed has not been surveyed due to no access, dense vegetation, and steep terrain. Based on aerial photography and topographic maps, the stream channel is an entrenched, high gradient, naturally stable to unstable, A channel type throughout the subwatershed.

Bull Run Basin Watershed

Dry Meadow Creek (9DA)

Dry Meadow Creek subwatershed flows south into Bull Run Creek. Dry Meadow is located near the center of the subwatershed. West Horse Meadow is located to the northwest of Dry Meadow near the western headwaters of the subwatershed. Baker Meadow is also located above Dry Meadow to the northeast near Baker Peak. Approximately 4.63 miles of stream exist within the subwatershed. Perennial flow consists of 3.88 miles while the intermittent flow consists of 0.75 miles.

Several roads exist within the subwatershed. These roads are 23S16, 24S02, 24S08, 24S24, 24S24A, 24S25, 24S34, 24S34A, 24S37, 24S45, 24S45A, 24S77, 24S80, 24S80B, 24S80C, 24S83, and 24S83A. Total mileage for these roads is approximately 13.1 miles. There are no trails within the subwatershed.

Dry Meadow Creek subwatershed contains the headwaters of Bull Run Creek. Dry Meadow is at the headwaters and is supplied by two perennial flows, one from the west near West Horse Meadow and the other near Baker Meadow to the east. An intermittent flow enters Dry Meadow from the north.

The northern flow begins as a moderate gradient, moderately entrenched, gravel dominated, stable sensitive, B4 channel. The gradient becomes less steep and then shifts the channel to a low gradient, slightly entrenched, cobble dominated, stable sensitive, C3 channel type. Shortly before entering the meadow the channel changes back to the previous B4 channel type. As the stream enters the meadow, the channel shifts to a slightly entrenched, low gradient, stable sensitive, gravel dominated, C4 channel type. Shortly after entering the meadow the channel confluences with a perennial flowing stream coming from West Horse Meadow.

The western flow into Dry Meadow begins as an entrenched, very high gradient, naturally unstable, cobble dominated, A3a+ channel type. Once in the meadow, the stream channel becomes a slightly entrenched, low gradient, stable sensitive, gravel dominated, E4 channel. The creek continues as an E4 channel till the confluence with the eastern perennial flow at the check dam structure.

The eastern perennial flow begins as a slightly entrenched, low gradient, stabile sensitive, E5 channel. The channel continues this way through Dry Meadow till the confluence with the western perennial flow at the long boulder check dam structure. Once below the structure, the channel becomes a moderately entrenched, low gradient, stabile sensitive, sand dominated, B5c channel type for the remaining of the meadow.

Dry Meadow has received restoration attempts in the early 1990s. Headcuts have migrated up from the culvert, at the base of the meadow, and impacted both channels near the center of the meadow. Check dams and felling of trees to change the flow patterns were not successful. Remnants of these restoration attempts can be seen today.

Once the creek leaves the meadow, towards the south, the channel becomes significantly steeper. The stream channel shifts to a very high gradient, entrenched, naturally unstable, cobble dominated, A3a+ for the remainder of the subwatershed.

Tyler Meadow Creek (9DB)

Tyler Meadow Creek is the headwaters for Bull Run Creek. Tyler Meadow resides near the lower portion of the subwatershed. There is approximately 1.04 miles of stream and it is all perennial.

Several roads exist within the subwatershed. These roads are 23S16, 24S08, 24S25, 24S25A, 24S25B, 24S34, 24S34A, 24S35, 24S37, 24S37A, 24S46, 24S26A, 24S50, and 24S83. Total mileage for all these roads is approximately 9.3 miles. There are no trails within the subwatershed.

Headwaters of Tyler Meadow Creek begin to the northwest of Tyler Meadow below Tobias Peak. The stream begins as an entrenched, high gradient, cobble dominated, naturally unstable, A3 channel type. The channel confluences with an unnamed stringer meadow and changes its substrate. The stream becomes a gravel dominated A4 channel type. A small section below the confluence shifts the channel substrate back to the prior cobble dominated system. The stream channel remains this way until it enters Tyler Meadow.

Once in Tyler Meadow, the stream channel shifts to a moderately entrenched, moderate gradient, sand dominated, stable-sensitive, B5 channel. A few hundred feet below the check dam structure, the channel becomes a slightly entrenched, moderate gradient, sand dominated, stable sensitive, E5b channel type for the remainder of the meadow.

Tyler Meadow itself has experience restoration attempts in the 1980's and 1990's. Attempts of improving the meadows habitat and hydrologic function from bull dozing the entire meadow to stopping headcuts with check dams have failed. Old remnants of these attempts are still visible within the meadow itself.

Once leaving the meadow, the stream channel becomes more confined by the surrounding landscape. The stream channel shifts to a steeper, moderately entrenched, moderate gradient, cobble dominated, naturally stable B3 channel type. Prior to the confluence with Bull Run Creek, the channel changes to an even stepper entrenched, high gradient, boulder dominated, naturally stable, A2 channel type.

Shultz Creek (9DC)

Shultz Creek confluences with Bull Run Creek in Bull Run Basin. The central portion of the subwatershed is private property. No structures are located within the private property. There are approximately 3.1 miles of perennial stream.

Several roads exist within the subwatershed with a total mileage of approximately 4.9 miles. These roads are 23S16, 24S03, 24S25, 24S35, 24S46, 24S46A, and 24S50. A portion of the Bull Run Trail is located on the subwatershed divide to the east and is shared with the Bull Run subwatershed (9DL).

Shultz Creek begins below Forest Service road 24S03 in section 19. The stream begins as a moderately entrenched, moderate gradient, cobble dominated, naturally stable, B3 channel. The terrain becomes flatter creating a small meadow ecosystem. Approximately a quarter of a mile of stream through this section is a slightly entrenched, moderate gradient, cobble dominated, stable-sensitive, E3b channel type. Once out of the meadow the stream transitions back to a moderately entrenched, moderate gradient, cobble dominated, naturally stable, B3 channel into and through the private property. Outside of private property and below Forest Service road 24S35, the channel becomes steeper forming a high gradient, entrenched, boulder dominated, naturally stable, A2 channel type. As the stream parallels a trail along the ridge (32E39), the substrate changes to a bedrock dominated A1 channel type for about 1/5th of a mile. The channel becomes less steep and transitions back to a moderately entrenched, moderate gradient, cobble dominated, naturally stable, B3 channel. The remaining portion of the stream channel to the confluence of Bull Run Creek is an entrenched, high gradient boulder dominated, naturally stable, A2 channel.

Deep Creek (9DD)

Deep Creek subwatershed flows east towards Bull Run Creek. There is approximately 4.46 miles of stream within the subwatershed. Approximately 2.43 miles is perennial while the remaining 2.03 miles is intermittent. The intermittent channel begins below the private property near the outlet of Portuguese Meadow. The Tip Top mine is located above the meadow. The headwaters of Deep Creek are located just north of Panorama campground. Where the perennial portion of Deep Creek begins is where the Deep Mine is located. Both mines are no longer active.

Several roads exist within the subwatershed with a total mileage of approximately 11.3 miles. These roads are 23S16, 24S03, 24S09, 24S10, 24S15, 24S15A, 24S35, 24S35A, 24S35C, 25S37, 25S37A, and 25S38A. There are no trails within this subwatershed.

Deep Creek begins below Forest Service roads 24S03 and 24S35, east of the Deep Creek Cave. The stream begins as an entrenched, very high gradient, cobble dominated, naturally unstable, A3a+ channel. The topography becomes less steep changing to a high gradient A3 channel type. Half way in section 32 to about half way in section 4, the stream substrate shifts to a boulder dominated A2 channel type. The remaining portion of Deep Creek shifts to a bedrock A1 channel for the rest of the subwatershed.

An unnamed tributary flowing east from Portuguese Meadow has not been surveyed. Based on aerial photos and topography, the stream channel is assumed to be similar to Deep Creek, but not as steep. The stream channel is likely a moderately entrenched, moderate to high gradient, cobble dominated, naturally stable, B3 and B3a+ channel type.

Girl Scout Camp (9DE)

Girl Scout Camp subwatershed confluences with Deep Creek. Approximately 2.76 miles exist of both perennial and intermittent streams. The perennial portion is approximately 1.86 miles and the intermittent is approximately 0.9 miles. Both Portuguese and Sunday Peaks are located at the top of the subwatershed. An unnamed meadow resides at the top of the watershed east of Portuguese Peak and north of Camp Mountain Meadows.

Three roads exist within the subwatershed for a total mileage of approximately 1.39 miles. These roads are 24S15, 24S15A, and 24S28. Two trails exist in the upper portions of the subwatershed.

The headwaters of Girl Scout Camp subwatershed begin below Forest Service road 24S14. The stream starts off as a moderately entrenched, moderate gradient, stable sensitive, sand dominated with boulders, B5 channel type. Very small inclusions of very high gradients (10% or greater) are within the B5 section of channel. The channel remains this way till the gradient becomes significantly steeper near the boundary of sections 5 and 4. The channel then shifts to a high to very high gradient, entrenched, boulder dominated, A2 to A2+ channel types. The stream channel remains this way for the remainder of the subwatershed.

A small unnamed tributary enters the main channel from the southwest near the bottom center of section 5. The unnamed stream channel is also a moderately entrenched, moderate gradient, stable sensitive, sand dominated, B5 channel type. The channel remains this way to its confluence with the main stream channel.

Baker Creek (9DJ)

Baker Creek subwatershed is located along Baker Ridge. The creek flows south and into Bull Run Creek. Approximately 1.81 miles of stream exist and it is all intermittent flow.

There are four roads and all are located in the headwaters of the subwatershed. These roads are 24S80, 24S80A, 24S80B, and 24S80C. Totals miles of road are approximately 1.3 miles. There are no trails.

Baker Creek subwatershed contains an unnamed intermittent creek. There is no access via road or trail to subwatershed. The topography maps may show a road going to the creek, but this is not true. Due to limited access and steep terrain, the creek is expected to be similar to the steep section in the neighboring subwatershed 9DA to the west. The channel is expected to be a very high gradient, naturally unstable, cobble dominated, A3a+ channel type for the entire subwatershed.

Bull Run (9DL)

Bull Run subwatershed is located upstream of Bull Run Basin. Approximately 3.03 miles of both perennial and intermittent flow exist. The perennial flow is approximately 1.96 miles while the remaining 1.07 miles is intermittent.

Two roads exist within the subwatershed. These are 24S35 and 24S46. Both roads are located in the headwaters and approximately total 1.6 miles. The Bull Run Trail (32E39) is located along the western ridgeline. It begins at road 24S35 and follows the ridge down to Bull Run Basin.

Bull Run subwatershed begins below the confluence of Bull Run Creek and Tyler Meadow Creek. The stream starts as an entrenched, high gradient, boulder dominated, naturally stable, A2 channel type. An unnamed tributary from the Baker Creek (9DJ) subwatershed enters in from the northeast. Above and below this confluence, the channel remains the same but shifts to a bedrock dominated A1 channel type. Shortly after the confluence the stream returns back to boulder dominated A2 channel type.

As the gradient becomes less steep, the stream shifts to moderately entrenched, moderate gradient, bedrock dominated, naturally stable, B1 channel type. Below an unnamed tributary entering from the east, the channel becomes steeper changing to an entrenched, high gradient, boulder dominated, naturally stable, A2 channel type. Prior to the confluence with Shultz Creek, the channel shifts to a bedrock dominated A1 channel type for the remainder of the subwatershed.

South Bull Run Creek (9DM)

South Bull Run Creek subwatershed contains Bull Run Creek and Bull Run Basin. Approximately 2.89 miles of stream flow through this subwatershed and all of it is perennial flow. Bull Run Trail (32E39) follows Bull Run Creek throughout the subwatershed. There are no roads.

South Bull Run Creek subwatershed begins below the first Bull Run Trail (32E39) crossing. Bull Run Creek at this point is as a naturally stable, boulder dominated, high gradient, entrenched, A2 channel type. It remains this way till the second trail crossing and switches to a moderately entrenched, moderate gradient, bedrock dominated, naturally stable, B1 channel type for the remainder of the subwatershed.

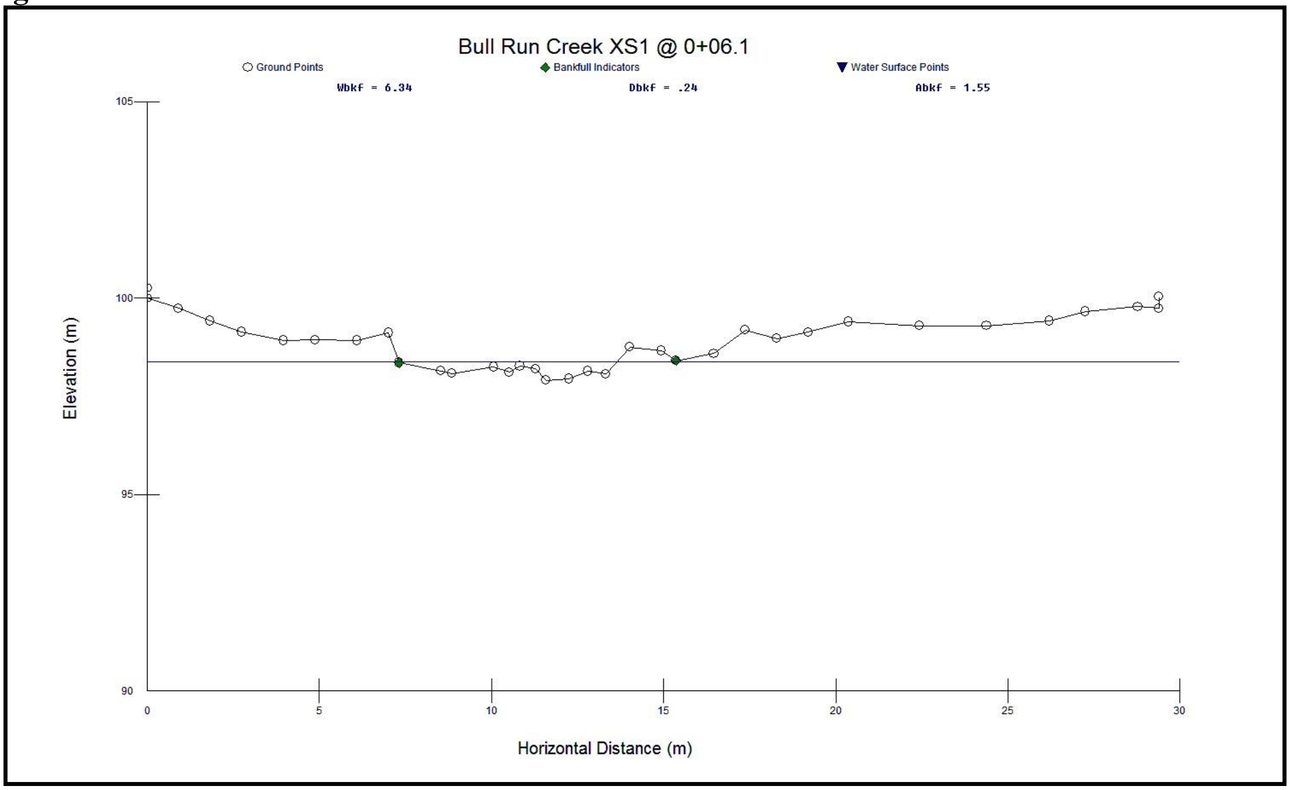
Bull Run Creek contains one Stream Condition Inventory (SCI) site was established in July of 2013 downstream from the second trail crossing on the Bull Run Creek Trail. The site was established to monitor the Tobias Project. Table 23 summarizes the SCI data collected.

Table 23. Summary of SCI data for Bull Run Creek	
Large Wood Debris (m^3/m)	0.00
% Shading	76
Temperature (Celsius)	19.2
pH (ppm)	7.5
Alkalinity ($CaCO_3$)	75
Mean Particle Size in mm (D50)	125.91 (Cobble)
Width to Depth Ratio	23.93
Hilsenhoff Biotic Index - Rating	Not Available
Riparian Impact Rating	Low
Rosgen Channel Type	B3a

The stream channel is a high gradient, cobble dominated, naturally stable, low impact, B3a channel type. The reach length is approximately 67 meters. The width to depth ratio is higher than it should be for a B channel type. However, during the time of survey past flooding was observed within this reach creating overflow channels and debris jams along the floodplain. This could alter the banks of the stream and widen the channel. B channel types are known to recover naturally and are not a concern for future management actions within the watershed. Figure 19 displays a cross section taken at 6.1

meters along the SCI survey of Bull Run Creek at Bull Run Basin. Figure 20 displays the particle size distribution throughout the reach. The average size particle is cobble.

Figure 19. View of Bull Run Creek's Cross Section 1 at 6.1m



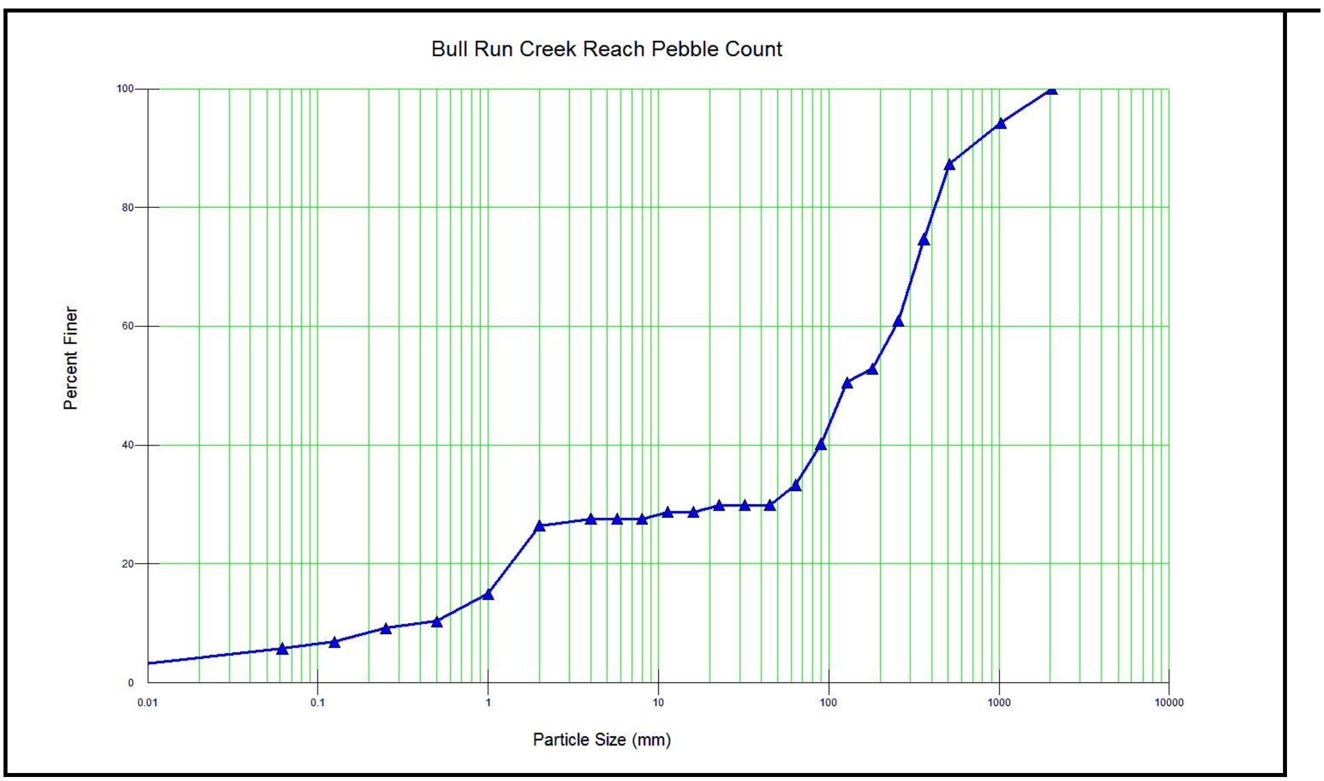


Figure 20. Reach Pebble Count for Bull Run Creek

Average stream shading provides approximately 76 percent cover throughout the reach. Average amount of large woody debris was 0.11 m^3/m. Water chemistry measured total alkalinity, pH, and stream temperature. Recorded total alkalinity was 75 ppm $CaCO_3$. The pH was slightly basic at 7.5. Recorded water temperature for that day was 19.2 degrees Celsius. Aquatic species were collected during time of survey. Figure 21 shows a panoramic view of the surveyed reach at cross section 1 looking downstream.

Figure 21. Bull Run Creek cross section 1 panoramic view looking downstream.

Aquatic species results are still being analyzed and are not available at this time. Results will be analyzed and rated using the Hilsenhoff Biotic Index (Zimmerman, 1993). Even through results from the lab have not returned, they are expected to have minimal to no organic pollutants due to minimal management actions occurring in the area within approximately the last 10 to 15 years. Several fish were observed within the reach during the time of survey.

Unnamed (9DN)

Unnamed subwatershed contains two intermittent streams. Both flow through Bull Run Basin and into Bull Run Creek. All of the flow, approximately 3.09 miles, is intermittent. A portion of the Bull Run trail is in the lower portion of the subwatershed. There are no roads within Unnamed subwatershed.

Unnamed subwatershed contains two intermittent channels. Limited access, thick vegetation, and steep terrain have limited surveys to where the Bull Run Trail intersects the creeks near Bull Run Creek. Both trail crossings discovered the streams to be a moderate gradient, moderately entrenched, stable sensitive, sand dominated, B5 channel type. Using aerial photography and topography maps, the upper portions of both streams are expected to be moderate to fully entrenched, very high gradient, naturally unstable, cobble to gravel dominated, A3 and A4 channel types.

WILDLIFE

AFFECTED ENVIRONMENT

Four documents were completed for the assessment of wildlife resources as part of the Tobias Project analysis. These include: 1) the *Biological Assessment for the Tobias Ecosystem Restoration Project* (Wildlife BA) (Hemphill and Galloway 2015) which documents the review of the potential effects of species classified as federally endangered or threatened under the Endangered Species Act (ESA, 1973) (19 U.S.C 1536 (c)); 2*)* the *Biological Evaluation for the*

Tobias Ecosystem Restoration Project (Wildlife BE) (Galloway 2015a) documents the review of potential effects of implementing the Tobias Project on Pacific Southwest Region sensitive species except for the fisher; 3) the *Tobias Ecosystem Restoration Project Supplemental Biological Evaluation for Fisher* (Cordes and Lang 2015); and 4) the Management Indicator Species Report (MIS Report) (Galloway 2015b) which evaluates the effects on MIS species habitat that are found within the Tobias project.

Table 24 displays the wildlife and aquatic species evaluated in detail for the Tobias Project, Information provided in this section of this EIS was summarized from the Wildlife BA, BEs, and the Management Indicator Species (MIS) Report and are incorporated by reference.

Table 24: Wildlife Species Considered in Detailed Analysis for the Tobias Project.

Species	Status	Effects Analysis Document
California condor (*Gymnogyps californianus*)	FE, CH	Biological Assessment
Mountain yellow-legged frog (*Rana muscosa*)	FE	Biological Assessment
Northern Goshawk (*Accipiter gentilis*)	FSS, CSSC	Biological Evaluation
California spotted owl (*Strix occidentalis occidentalis*)	FSS, CSSC, MIS	Biological Evaluation
Fisher (*Pekania pennanti*)	FSS, FC, CSSC	Biological Evaluation
American marten (*Martes americana sierrae*)	FSS, CSSC, MIS	Biological Evaluation
Pallid bat (*Antrozous pallidus*)	FSS, CSSC	Biological Evaluation
Fringed myotis bat (*Myotis thysanodes*)	FSS	Biological Evaluation
Townsend’s big-eared bat (*Corynorhinus townsendii*)	FSS	Biological Evaluation
Fox sparrow (*Passerella iliaca*)	MIS	MIS Report
Mountain quail (*Oreotyx pictus*)	MIS	MIS Report
Sooty grouse (*Dendragapus obscurus*)	MIS	MIS Report
Northern flying squirrel (*Glaucomys sabrinus*)	MIS	MIS Report

Species	Status	Effects Analysis Document
Hairy woodpecker (*Picoides villosus*)	MIS	MIS Report
Status Key: FE-Federally Endangered, FC – Federal Candidate Species, CH-Designated Critical Habitat, FSS-Forest Service Sensitive, CSSC-California State Species of Concern, MIS-Forest Service Management Indicator Species		

Existing Environment

The Tobias Project encompasses a variety of vegetative communities and forest structure classes (size and density) based on California Wildlife Habitat Relationships (CWHR) classification system (CDFG 2005). Community types and acres are displayed in Table 25. Forested types encompass approximately 37% of the analysis area, with shrub types comprising 61%. A large percentage of shrub component has developed as a result of the Stormy Fire (1990). It is estimated that approximately 25-30% of the shrub type will transition back to a Sierran mixed conifer habitat type based on what existed prior to the Stormy Fire.

Aspects of stand structure important to many of the wildlife species addressed include the use of stands with higher overhead canopy, and availability of large live trees and snags, and large woody debris. Vegetation types with the most value in providing these requirements include forest types with size and density classes 6, 5D, 5M, 4D, and 4M. There is an estimated 2,150 acre of these habitat types in the Tobias Project analysis area.

Table 25: CWHR Vegetation Types by Size and Density Classifications and Acres in the Tobias Project Analysis Area.

Habitat type	Acres	Percent of Analysis Area	CWHR Size and Density	Acres
Shrub, Young Sierran mixed conifer, fir (WFR & RFR), Jeffrey pine, ponderosa pine, montane hardwood-conifer, and montane hardwood.	7,736	71%	Shrub	6,633
			1 & 2 S, P, M, X	1,103
Sierran mixed conifer, fir (WFR & RFR), Jeffrey pine, ponderosa pine, montane hardwood-conifer, and montane hardwood.	433	4%	3S	10
			3P	151
			3M	217
			3D	55
Sierran mixed conifer, Fir (WFR & RFR), Jeffrey pine, ponderosa pine, montane hardwood-conifer, and montane hardwood.	2,570	24%	4S	29
			4P	241
			4M	684
			4D	750
			5S	51
			5P	101

			5M	365
			5D	351
			6	0
Other miscellaneous vegetation or rock outcrop.	162	1.0%	Wet Meadow, annual grass, Lacustrine, & Barren	162
Total	10,900	100%		10,900
CWHR Size Classes: 1 = < 1 " diameter at breast height (dbh); **2 =** 1" - 6" dbh; **3 =** 6" - 11" dbh**4 =** 11" - 24" dbh; **5 =** > 24" dbh; **6 =** class 5 trees over a distinct layer of class 4 or 3 trees **CWHR Density Classes: S** = 10-24%; **P** = 25-39%; **M** = 40-59%; **D** = 60-100%; **X** = canopy unknown				

Dead trees (or snags) are an essential component of mature forests ecoystems and utilized by wildlife for nest and den sites, rest sites, and in foraging. A natural range of varibility (NRV) for snag resources was established (See the Tobias BE for discussion). The NRV for snags (≥ 15” dbh) in forested types was established at 0 to 8.0 snags/acre, with the range for larger size class snags ≥ 24” dbh estimated at 2 to 4 snags per acre. This range encompasses recommended values recommended in the Sierra Nevada Forest Plan Amendment (USDA 2001).

Forest Vegetation Simulator (FVS) modeling of plot data taken within the Tobias Project area suggest an estimated 2.3 snags/per acre greater than 15”dbh, with snags ≥ 24” DBH estimated at 1.7 snags/acre (2014, Table 26). The existing drought cycle (FY 2013-2015) is resulting in moderate snag recruitment across all size classes on the Forest. This has increased the availability of snags across the Tobias landscape, and was pronounced over the summer of 2015. Based on current snags values, and realized tree mortality from the drought, snag values are anticipated to be well within the NRV identified.

Table 26. Weighted Average Snags per Acre by Size Class for all Modeled Forest Types in the Tobias Project Area (Existing condition 2014).

Size Class (dbh)	2010	2014	2024	2034	2044	2054	2064
15" - 23.9"	0.2	0.6	1.5	4.3	8	12.5	14.4
≥24"	1.6	1.7	2.4	3.4	4.6	6.3	7.9
Total	1.8	2.3	3.9	7.7	12.7	18.8	22.3

Field plots conducted to assess large woody debris (>12”) show there is an average of 20 down logs per acre (or 23 tons per acre), with pockets exceeding 40 tons/acres in some areas. These values slightly exceed past recommendations of maintaining 10 to 20 tons/acre as stated in the 2001 SNFPA EIS which was used for this analysis.

THREATENED, ENDANGERED, OR PROPOSED SPECIES

SPECIES AND HABITAT ACCOUNTS

California Condor *(Gymnogyps californianus)*

Condor Habitat and Biology: Key features on the landscape for the California condor include critical and essential habitat as designated by the US Fish and Wildlife Service (USFWS), nest and roost habitat, and forging areas. Primary condor use patterns of Sequoia National Forest include most west slope forests of the Sierra Nevada in proximity to downslope foothills adjacent to the San Joaquin Valley, from the Breckenridge Mountains north through the Hume Lake District.

Critical and Essential Habitats: Designated critical habitat for the condor occurs within and adjacent to the Forest, these include: 1). "#6 Blue Ridge condor area" located just off the Forest approximately 20 air miles northwest of the Tobias Project Area, 2). "#9 Tulare Country Rangelands" which overlaps a small section of the Western Divide Ranger District near Springville, California, approximately 17 air miles northwest of the Tobias Project Area, and 3). "#8 Kern County Rangelands" located off the Forest approximately 8 air miles southwest of the Tobias Project Area (Figure 22).

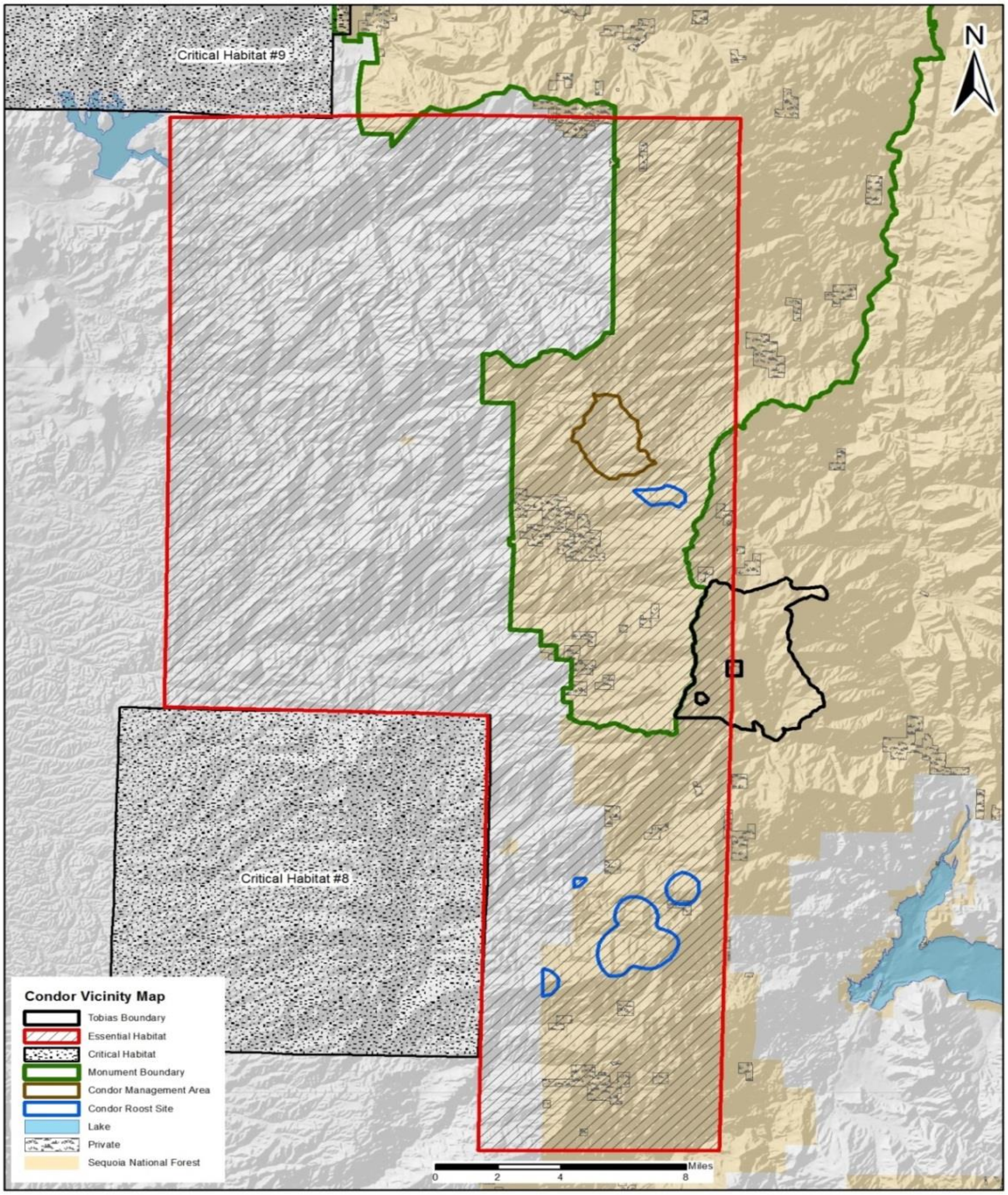
The USFWS also designated the "Glennville/Woody essential habitat" for the benefit of the California condor which overlaps portions of Sequoia National Forest Figure 22). Unlike designated critical habitats, essential habitat has no legal status under the Endangered Species Act but highlights land areas where historic use occurred and that maybe used to supplement critical habitat at some future date. Essential habitat includes historic roost sites such as Lion Ridge and Basket Pass, and the last condor nest located recorded in 1984 in Starvation Grove.

Of the estimated 320,000 acres designated as part of "Glenville/Woody essential habitat", a total of 129,680 acres overlaps with Sequoia National Forest. This includes 122,360 acres on Forest Service system lands, and 7,320 acres on private property (inholdings) (Figure 22). The Tobias Project analysis area encompasses approximately 4,514 acres of essential habitat, or 3% of the total essential habitat that overlaps with the Forest. The existing California condor population is monitored on a daily basis, and continues to utilize historic flight paths and the same use areas for perching and roosting as their ancestors. Reuse of specific roost sites on the Forest, are influenced by landscape topography and weather patterns, and their proximity to their downslope foraging habitat.

Courtship and Nest Habitats: Condors most frequently nest on various types of rock escarpments such as cliffs, ledges, potholes, and depressions, which are relatively isolated and surrounded by brush (Snyder and Schmitt, 2002, USDI 1984). Historic nesting efforts in the vicinity of Sequoia National Forest have been limited to two isolated cases in which a large cavity in a giant sequoia tree (*Sequoiadendron giganteum*) was used. One nest occurred on the Forest in Starvation Grove in 1984 approximately 4.5 air miles northwest of the Tobias Project, located on the west slope of the Greenhorn Mountains. The other was reported further north in a giant sequoia grove located on the Tule River Indian Reservation (1940s)(Pers. Com. J.Brandt, USFWS 2010).

Courtship, nest selection, and egg-laying typically occur from October through May. The egg is incubated by both parents and hatches approximately 59 days later. Chicks take their first flight six to seven months later and are fully independent the following year. Since the condor re-introduction program began in 1992, no nesting attempts have occurred on Sequoia National Forest. Based on the current population size and use patterns observed, it is estimated that it will be several more years before condors explore Sequoia National Forest with sufficient frequency to establish a reproductive territory (Pers. Com. J.Brandt, USFWS biologist 2015). The Tobias Project area contains no giant sequoia groves or other cliff like habitat which would serve as an attractant for nesting purposes.

Figure 22: Glennville/Woody Essential Habitat including high use areas, and Designated USFWS Critical Habitat for Condor in relation to the Tobias Project Analysis Area.



Roost Habitat: Roost sites utilized by condors are located upslope from low-elevation foraging zones (i.e. Critical Habitats #8 and #9). Koford (1953) noted that roost trees are often situated above cliffs or on upper two-thirds of steep forested slopes where there is a long unobstructed space for downhill flight. Roost sites typically do not occur on the very tops of ridges where there is little protection from the wind (Pers. communication J. Grantham, USFWS 2010).

Key condor roost locations in essential habitat on the Forest include Parker Peak, Cold Springs Peak, Lion Ridge, and Basket Pass (USDI 1984). None of these areas occur within the Tobias Project area. Roosting substrates typically used include mid to large size class snags or emergent live trees. Past informal consultation with the USFWS has recommended leaving 2-3 snags or large live trees per acre for this species.

Foraging Habitats and Diet: The principal foraging zones near the Sequoia National Forest include west slope grassland and oak-savannah habitats at lower elevations within the foothill region directly adjacent to the southern San Joaquin Valley. The bulk of critical habitat designated for the condor encompasses primarily private held range lands in Kern and Tulare Counties located west of the Forest boundary. California condors are opportunistic scavengers, feeding mainly on carcasses of large dead animals such as livestock (cows, sheep, and horses) and mule deer.

Risk Factors: Factors influencing condor decline are fairly well understood. Contributing factors have included incidental shootings, egg collecting, collisions with power lines or other obstacles, and various forms of poisoning (USDI 1996, AOU 2008). Many of these factors have been greatly reduced through behavior modification training and new State legislation banning use of lead ammunition.

FOREST SERVICE SENSITIVE SPECIES

SPECIES AND HABITAT ACCOUNTS:

California spotted owl (*Strix occidentalis occidentalis*)

State Wide Range, Distribution, and Trend: California spotted owl population size in the Sierra Nevada was estimated in 2006 at 1,865 owl sites, with 1,399 sites on NFS lands, 314 sites on private lands, 14 sites on Bureau of Land Management Lands, 8 on State of California lands, and 1 on Native American lands (USDI, Federal Register May 24, 2006 [Volume 71, Number 100]). These figures were based on a compilation of all known sites recorded over the past 30-40 years, and it is unknown what proportion remains occupied at this time (Keane 2014).

The last meta-analysis conducted to evaluate population trends from existing demographic studies in the State concluded that with the exception of the Lassen study area, California spotted owl populations were stable with adult survival rate highest at the Sequoia-Kings Canyon National Park study site (Blakesley et al 2010). However, most recently Bond and Hanson (2015) summarized published research findings of these long term studies, additional mark-recapture data collected from 2006-2011, and the use of new applications for statistical analysis in evaluating population trends. This research would suggests there is evidence of population decline on all three long term study areas on National Forest Service lands, and evidence of stable/increasing population trend in only the National Park study area (Munton et al. 2012, Conner et al. 2013, Gutiérrez et al. 2012, Tempel and Gutiérrez 2013, and Tempel et al. 2014). The causative factors contributing to these population trends, however, are not known (Keane 2014).

Distribution within Sequoia National Forest and Tobias Project Area: At present, the Forest manages a network of 138 spotted owl Protected Activity Centers/Home Range Core Area (PACs/HRCAs) encompassing an estimated 82,800 acres. Approximately half (70) of the Forest PAC/HRCAs occur within the Western Divide Ranger District. The Tobias analysis area overlaps with one PAC/HRCA and represents <1% of the Forest total (Figure 23). The PAC/HRCA encompasses the spotted owl activity center for the owl pair and the best available habitat. Table 27 displays the occupancy status and reproductive history results noted through surveys conducted.

Figure 23: California Spotted Owl Protected Activity Center and Home Range Core in the Tobias Project Analysis Area.

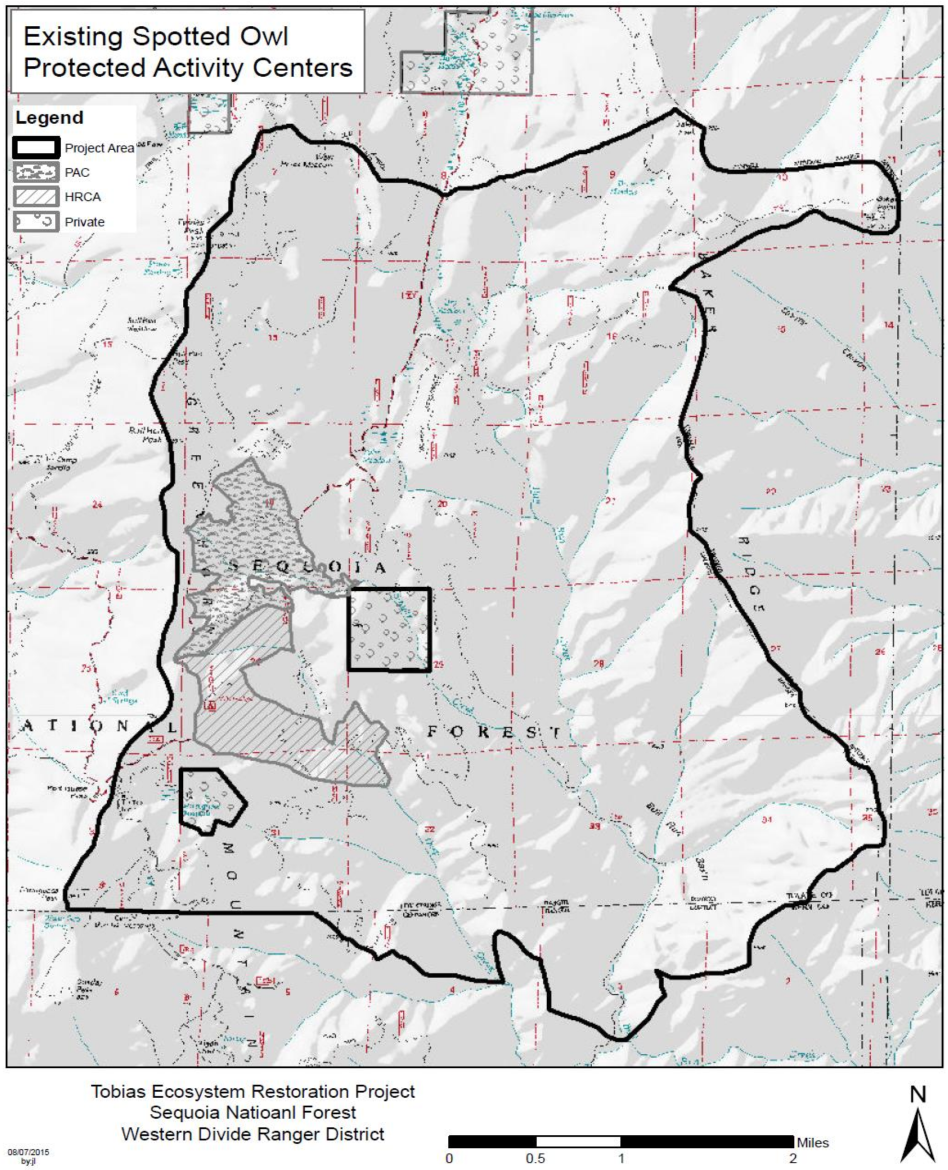


Table 27: California Spotted Owl PACs and Occupancy Status in the Tobias Analysis Area.

Year of Survey	Spotted Owl PAC TUL0036 & Survey Results
1989	M
1990	M,F (presence only)
1991	P-R-inn
2011	None
2013	None
2014	P-R-inn
2015	P-R-con
M = Male , F = Female, P = Pair occupancy, M, F = Male and female detected – not pair occupancy, U = spotted owl adult detected - sex unknown, NS = Not Surveyed, None = No spotted owls detected, P- R-inn = Pair occupancy, nesting unknown-reproduction unknown. P-R-con = Pair occupancy with reproduction confirmed. RS –resident single status	

Habitat Preference and Biology: Spotted owl are associated with mature coniferous forests with higher levels of canopy cover (≥70%), a multi-storied condition, and an abundance of large live trees and snags (Forsman et al. 1984, Bias and Guitierrez 1992, Call et al. 1992, Verner et al. 1992, Bond et al. 2004, Chatfield 2005). Foraging habitat consists of a broader range of vegetation types that may include younger, more open habitat (Williams et al. 2011, Roberts and North 2012, Keane 2013). Large coarse woody debris is a key habitat feature of spotted owl prey. It has been suggested that some level of landscape (forest) heterogeneity may be an important consideration for spotted owl management and can improve spotted owl conservation (Williams et al. 2011, Roberts and North 2012).

Habitat models based on best professional opinion contained in the CWHR database rate forest size and cover types in terms of their habitat suitability for the California spotted owl throughout its range (CWHR 2005). CWHR forest vegetation types with size and density classifications 4M, 4D, 5M, 5D typically are identified as moderate and high capability habitat. Using the CWHR Model and GIS mapping there is an estimated 183,840 acres of moderate and high capability habitat in the Western Divide Ranger District. There is an estimated 2,150 acres of moderate to high capability habitat found within the Tobias analysis area.

Nest/Roost habitat Characteristics: For this analysis the spotted owl activity center, or PAC, is considered representative of the nest stand. Nest/roost habitats are denoted by stands that exhibit a fair amount of structural complexity denoted by a greater representation of large live trees (≥ 24"dbh), multi-storied dense canopy, and an availability of large snags and down logs (Verner et al. 1992, Gutierrez et al. 1992 IN: Verner et al 1992, USDI 2006, Roberts and North 2012). Verner (et al. 1992) offered tentative estimates for forest attributes capable of meeting nesting and foraging habitat parameters in Sierran mixed conifer forests as displayed in Table 28.

Table 28. Selected Attributes Values of Suitable California Spotted Owl Habitat in Sierran Mixed Conifer Forest (Verner et al. 1992).

Stand Attributes	Nesting Habitat	Foraging Habitat
Percent Canopy Cover[5]	70-95%	50-90%
Total Live Tree Basal Area[6]	185-350 sq. ft./acre	180-220 sq. ft./acre
Total Snag Basal Area of large snags per acre[7]	20-30	7-17
Downed Woody Debris[8]	10-15 tons/acre	10-15 tons/acre

The values presented in Table 28 mirror conditions found in many spotted owl's nest and roost sites within Sequoia National Forest; however, site conditions exhibited at the south eastern extent of the Greenhorn Mountains are drier with many stands containing a slightly more open condition. Despite these dryer site conditions spotted owls are known to occur and successfully breed and produce young. Based on available scientific information presented, and personal experience with existing nest sites found in the Greenhorn Mountains, suitable canopy cover for nesting/roosting habitat for this analysis was defined as mature, multi-layered stands with canopy cover of 60% or greater, with foraging habitat identified as multi-layered stands with canopy cover of 40% or greater.

Nests occur in tree cavities, in broken tree tops or branches, on debris platforms, and on old raptor and squirrel nests (Gutierrez et al. 1992, 1995). Conifers typically selected as nest trees include the largest in the stand, averaging 45" dbh (Verner et al.1992, Keene 2014). The spotted owl breeding cycle extends from March to mid-to late September. Egg-laying occurs in March or April (Ibid). Young owls typically fledge from the nest in mid-to late June. Whitmore (2009) estimated that the mean area encompassing the nest and juvenile roosts was 308 acres.

Spatial Habitat Relationships: Nest/roost habitat (PAC), Core Area, Home Range

Scientific literature suggests that spotted owls select habitat at multiple spatial and temporal scales, with the least flexibility noted within the nest/roost stand (Protected Activity Center) and slightly broader core area, with more flexibility in the composition of habitat characteristics noted at the larger home range scale (Roberts and North 2012, Keene 2014).

Spatial Scale Baseline : Several recent studies have evaluated spotted owl habitat at various radii distances from the nest and roost stand creating a circular area of consideration (0.5 mile, 0.727 mile, 1.5 mile etc.) to describe associations between habitat and spotted owl occurrence, occupancy, and

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[5] Mostly in canopy > 30feet high, including hardwoods.

[6] Square feet per acre

[7] Dead trees >15" DBH and >20' tall.

[8] Tons per acre.

demographic parameters (survival, reproduction, habitat fitness) (Blakesley et al. 2005; Duger et al. 2005, 2011; Franklin et al. 2000; Gaines et al. 2010; Irwin et al. 2004; Kroll et al. 2010; Lee and Irwin 2005; McComb et al. 2002; Olson 2004; Seamans and Gutierrez 2007a, Tempel et al. 2014).

Figure 24 displays CWHR forest vegetation types with size and density classifications 4M, 4D, 5M, 5D identified as moderate and high capability habitat, at the various scales of analysis that were used to evaluate the effects of each alternative. These scales include: the PAC, the HRCA, 0.7 mile radius circle representing the core area, and a 1.5 mile radius circle representing conditions at the home range scale. Telemetry studies on California spotted owls closest to Sequoia National Forest determined a mean breeding pair home range size of approximately 2,500 acres (mixed conifer type)(USDA 2001). It is an assumption of this analysis that the pair present in the Tobias project area may utilize a larger home range size given the effects of the Stormy fire of 1990, and the compressed nature of available habitat to the upper two thirds of the slope. Therefore a 1.5 mile radius circle was used for this part of the analysis.

Considerations in terms of thresholds for the amount of habitat needed within the core and home range area are not well understood. That said, several research studies have offered tenative estimates. Bart (1995) suggested that the productivity and survivorship of the northern spotted owl increased with the proportion of suitable habitat found within the home range. His analysis utilized a 1.5 mile radius buffer from the activity center and suggested that survivorship and replacement-rate reproduction depended on having somewhere between 30 - 50 % of the landscape (or individual home range for a single owl pair) occupied by suitable owl habitat.

Lee and Irwin (2005, IN:USFWS, Federal Register May 24, 2006 [Volume 71, Number 100]) noted that "reproduction of spotted owls in the southern Sierra Nevada increased with canopy closure because more pairs successfully nested. However, this increase in canopy closure appeared to be more of a minimum threshold requirement than a trend, with only marginal increases in spotted owl reproduction noted as canopy closure increased past the minimum". The latter study suggested that at least 44 percent of a 1,062 acre area (0.72 mile radius area) around the owl activity center was comprised by forests with greater than 40% canopy cover. Once this minimum was met, the relative amount of forest with intermediate (40-70 percent) and dense (> 70%) canopy cover had little measurable effects on reproduction of spotted owls

Figure 24: Scales of analysis (PAC, HRCA, 0.7 mile radius and 1.5 mile radius) used for the California spotted owl and existing available suitable habitat as identified by CWHR Forest Vegetation Size and Density classifications (4M, 4D, 5M, 5D).

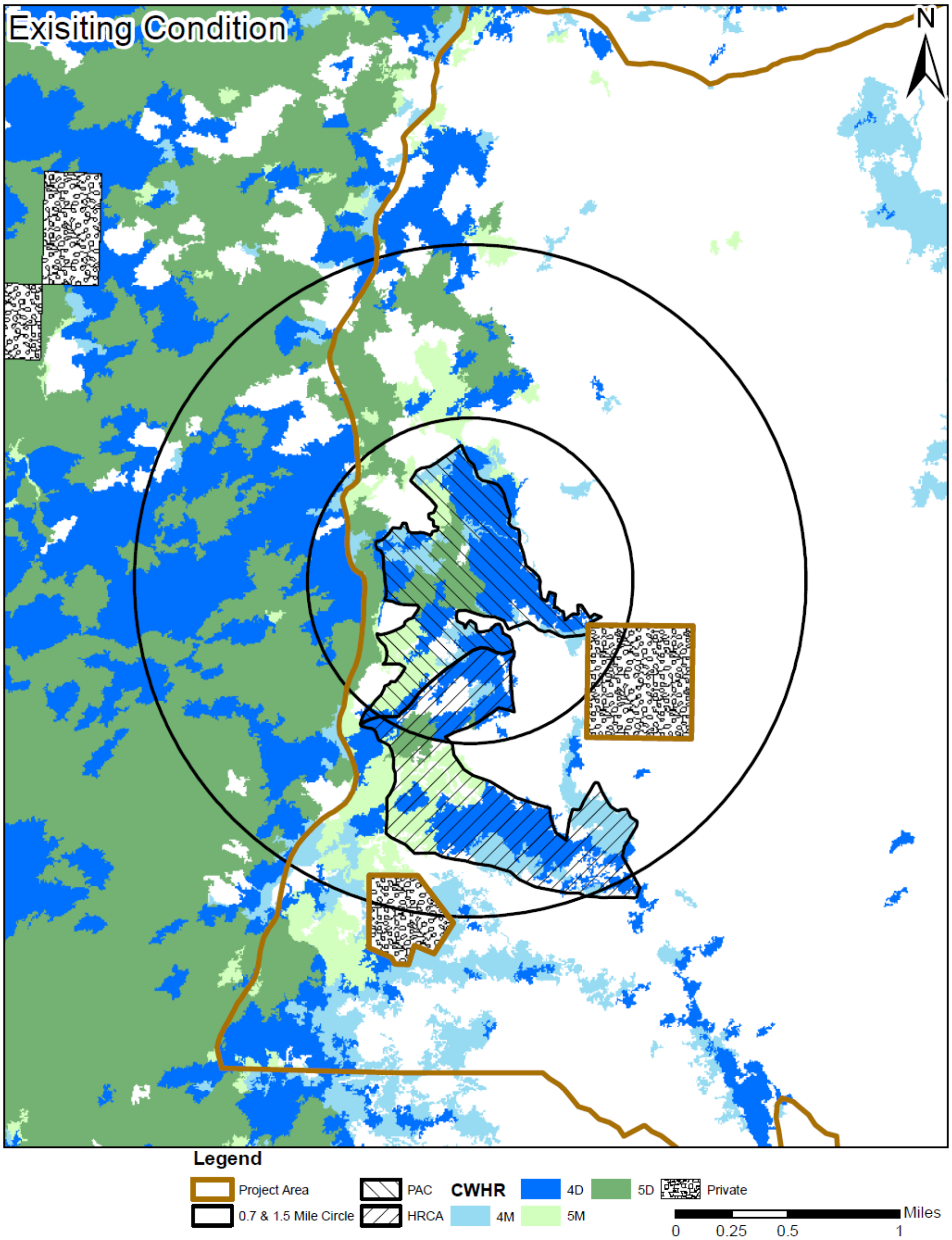


Table 29 displays the acres of suitable habitat available and the representative percent for each at each scale. Based on Bart, the availability of suitable habitat should fall within 1,350 to 2,250 acre range or exceed it if possible. Based on Irwin and Lee (2005), the availability of suitable habitat (≥40% canopy closure) should be in excess of 425 acres.

Table 29. Amount of existing suitable habitat (CWHR 4M, 4D, 5M, 5D and 6) in acres and its representative percent (%) at specified scales (1. 5 mile radius, 0.7 mile radius, PAC, and HRCA) surrounding the owl activity center in the Tobias Project Area (2014).

Spatial Scale of Consideration		**Owl ID TUL0036**	
	Total Scale area (Acres)	**Acres of suitable habitat**	**Suitable Habitat as a Percent Total Area**
Home Range - Desired target range for suitable habitat 30-50% of home range in suitable habitats (i.e. 1,350 – 2,250 acres or greater) (Bart 1995)	4,500	2,543	57%
Core Area - Desired target range for suitable habitat >44%, or a minimum of 425 acres (Lee and Irwin 2005).	1,063	598	56%
PAC - Protected Activity Center –intended to have the best 300 acres of suitable habitat (CWHR 4M, 4D, 5M, 5D and 6)	327*	305	93%
HRCA- Acres suitable habitat (CWHR 4M, 4D, 5M, 5D and 6). Home range core area – includes the best 600 acres of suitable habitat (incorporates the PAC and 300 acres additional acres)	705*	604	86%
***Represents the total acres within the PAC or HRCA boundary. Actual acres of suitable habitat as recommended by the 2004 SNFPA standards and Guidelines is 300 and 600 acres respectively.**			

Based on the above analysis at the 1.5 mile radius and 0.7 mile radius scales adequate habitat is available for the spotted owl pair in the Tobias Project area. At the 1.5 mile radius scale approximately 57% of the available habitat is comprised by suitable habitat types increasing the probability of survivorship and replacement-rate reproduction to occur. At the 0.7 mile radius scale 56% of the available habitat occurs in suitable habitat types suggesting a higher potential for nesting to occur. The pair did in fact nest with young observed in 2015 also suggesting suitability of available habitat. At the PAC and HRCA scales, 300 acres and 600 acres respectively, levels of suitable habitat desirable are being met per the SNFPA standards (USDA 2004).

Project actions will also be evaluated using CWHR scoring system for each scale. Alterations in forest vegetation size and/or density classifications as a result of project actions will be reflected through a change in relative CWHR score, the acres of suitable habitat retained at each spatial scale post implementation, and anticipated changes in desirable stand attributes. All CWHR scores by scale are displayed in Table 30. These values suggest that the highest habitat quality occurs with the PAC and HRCA, and then declines the further away from the activity center you go. At the largest scale, the project analysis area, the value is the lowest and still depicts the long term overall effects of the Stormy Fire.

Table 30. Estimated CWHR Scored Value Calculated at Various Scales from TUL0036 Protected Activity Center given available habitat (2014).

Scale of Consideration	CWHR Score
Tobias Analysis Area	0.146
1.5 Mile	0.438
0.7 Mile	0.415
HRCA	0.606
PAC	0.649

Prey dynamics: Spotted owls detect their prey by sight and sound, generally pouncing on their prey from an elevated perch or capturing it mid-air. Their diet varies geographically (Gutierrez et al. 1995). Dominant prey items include northern flying squirrels (*Glaucomys sabrinus*) and dusky-footed woodrats (*Neotoma fuscipes*) (Verner et al. 1992). Other prey species in the Sierra Nevada include "deer mice (*Peromyscus maniculatus*), voles (*Microtus* spp.), bats, amphibians, insects (which are consumed with the highest frequency but represent a much lower percentage of the diet by mass), ground and tree squirrels, chipmunks (*Tamias* spp.), and some species of bird" (summarized by Verner et al. 1992 and Gutierrez et al. 1995).

Foraging studies on spotted owl suggest they use a broader range of vegetation conditions in comparison to nesting and roosting habitats. It is thought this wider use is partially driven by the abundance and availability of important prey species (Ganey et al. 2003, Glenn et al. 2004, Irwin et al. 2007, and Williams et al. 2011). Roberts and North (2012) suggested that forest heterogeneity across the landscape can improve spotted owl viability. "Spotted owl survival and reproductive rates were higher in owl territories that included a mosaic of vegetation types infused within late-successional forest (Franklin et al. 2000), presumably because there was a greater diversity or abundance of prey within this mosaic (Ward et al. 1998, Zabel et al. 1995)".

Risk Factors: Potential threats and stressors to this species include high severity stand-replacing fires, expansion of barred owls (*Strix varia*), loss of large trees and dense canopy cover, habitat fragmentation, climate change, and disease.

Northern Goshawk (*Accipiter gentilis*)

State Wide Range, Distribution, and Trend: The northern goshawk is a year-round resident throughout many higher elevation areas of California. A synthesis of historical and current records indicates the species is well distributed across its core breeding range in most of the northern Coast Ranges, the Klamath and Siskiyou Mountains, across the Cascades, Modoc Plateau, and Warner Mountains, and south through the Sierra Nevada (Shuford and Gardali 2008, USDA 2001, Zeiner et al. 1990).

A network of northern goshawk Protected Activity Centers (PACs) has been established for known or newly discovered breeding territories on the Forest. The Forest currently manages 26 northern goshawk PACs encompassing an estimated 5,200 acres. A habitat suitability model developed by Keane and Parks (2000) for Sequoia National Forest was used to identify suitable goshawk nesting habitat in the project area. Surveys for northern goshawk were conducted in the breeding season using broadcast call methods. Surveys were conducted in the Tobias Project Area in 2011, 2013, and in 2015. No detections were noted through the surveys, and no goshawk PACs identified as part of the Forest network occur in the Tobias Project area. The closest active territory where a PAC has been established occurs approximately two air miles from the project vicinity.

Habitat Preference and Biology: The northern goshawk is associated with the use of older-age conifer, mixed, and deciduous forests. Forest stands with high suitability contain an availability of large live trees for nesting, a closed canopy for protection and thermal cover, and open space in the understory for maneuverability and flight (Hargis et al. 1994, Squires and Kennedy 2006). Northern goshawks forage within a wider range of forest types and conditions. Large snags and downed logs are considered important components within foraging habitat because such features benefit various prey species (Reynolds et al. 1992).

Using the CWHR Model, there are an estimated 183,170 acres of suitable habitat in the Western Divide Ranger District. Applicable forest vegetation types found within the Tobias Project area include: Jeffrey pine, red fir, white fir, Sierra mixed conifer, ponderosa pine, montane hardwood conifer, and montane hardwood (6, 5D, 5M, 4D, 4M). There are an estimated 2,150 acres of suitable nesting and roosting habitat within the Tobias Project area.

Reproduction and Home Range: Nesting chronology varies annually and by elevation. In general, nesting is initiated in February with nest construction, egg-laying, and incubation occurring through May and June (Dewey et al. 2003). Young birds hatch and begin fledging in late June and early July and are independent by mid-September. Goshawk nests are generally constructed in live trees and are usually among the largest trees in the stand. Human disturbance has the potential to cause northern goshawks to abandon nest sites during the nesting and post fledging period (Boal and Mannan 1994, USDA 2001). However, responses to disturbance can be quite variable and dependent on the individuals occupying the site.

Canopy cover values at nest sites appear to vary widely throughout California (USDA 2001). Based on mean values reported, the range extends from 31% to 70%. The mean breeding home range size for females varies in the Sierra Nevada. Studies from the Lake Tahoe region estimated female home ranges at approximately 4,980 acres, with those from the Inyo National Forest estimated at 3,300 acres (USDA 2001).

Prey Resources: Northern goshawks have evolved morphological adaptations for capturing prey in forested environments, but are also capable of ambushing prey in open habitats. Goshawks may forage along edge environments created between dense forests and adjoining habitats such as brush fields, plantations, meadows, streams, and some instances along roads. Northern goshawks are known to prey on over 50 species of birds and mammals throughout their western range (Graham et al. 1994). The key prey species or species groups in goshawk diets in the Sierra Nevada include Douglas squirrel, *Spermophilus* spp. (golden-mantled squirrel, belding squirrel, and California ground squirrel), chipmunks (*Tamias* spp.), Stellar's jay, northern flicker, and American robin (USDA 2001).

Many of these species are ground dwellers or spend a proportion of their time near the ground. Important components for foraging habitats also include an availability of snags (min. 3/ac. >18 inches dbh) and downed logs (minimum 5/ac. greater than 12 inches dbh) for prey populations.

Snags and logs are key components of goshawk foraging areas as they provide habitat for prey species. Prey availability rather than prey abundance, within suitable foraging habitats, appears to be more important to habitat use by this species (Reynolds et al. 2006).

Risk Factors: Some of the threats facing goshawk include habitat loss and fragmentation (e.g., loss of large diameter trees), forest structure changes and changes in prey populations due to fire suppression and climate change, risk of habitat loss due to stand-replacing fires, and disturbance from human activity in and near territories.

Marten (*Martes americana*)

Distribution within Sequoia National Forest and Tobias Project Area: Marten distribution on Sequoia National Forest extends from the middle of the Greenhorn Mountains near the Kern/ Tulare County border north through the Western Divide Ranger District including the western portion of the Golden Trout Wilderness through the Hume Lake District.

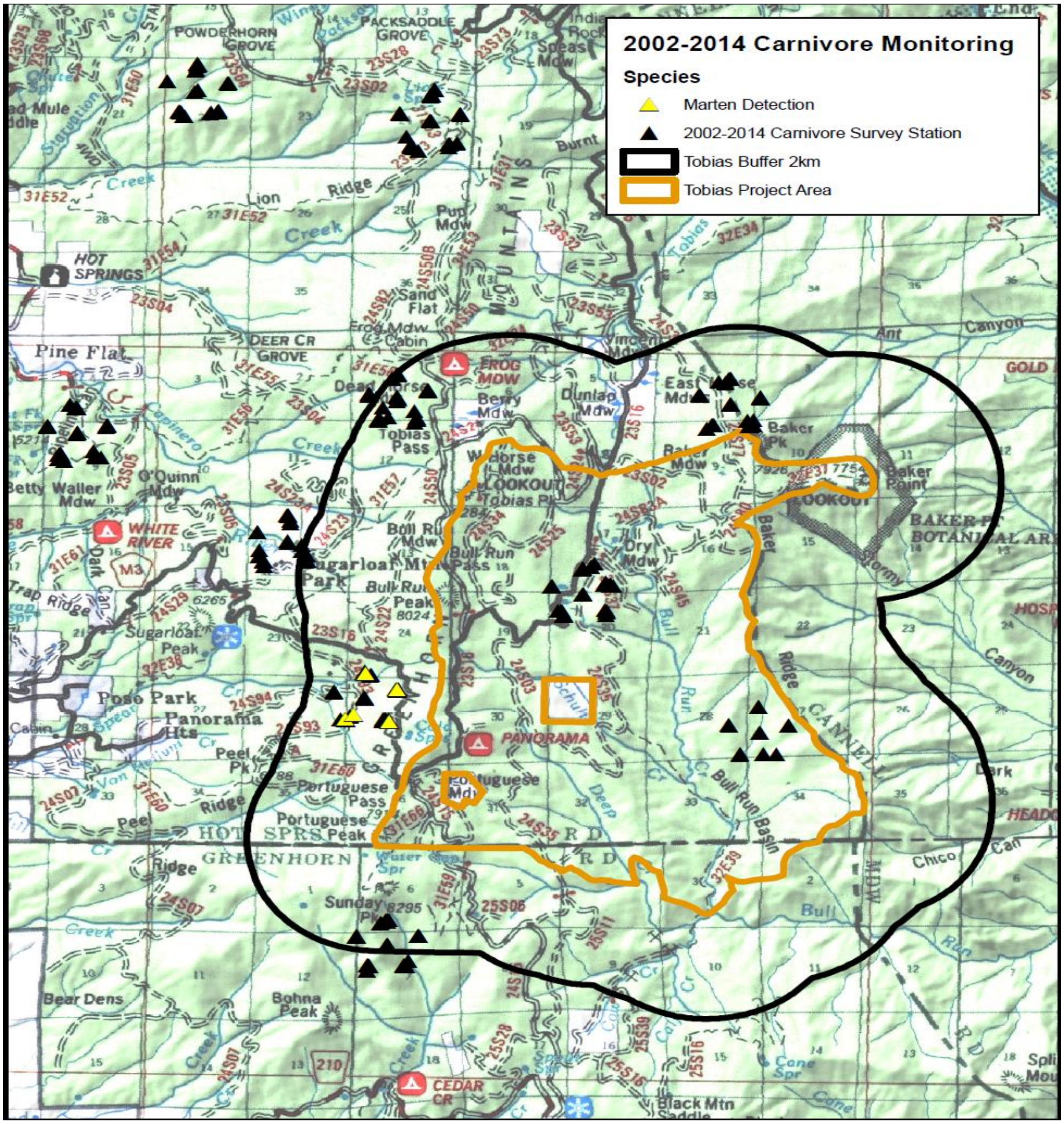
Marten *Long Term Status and Trend Monitoring Program* began in 2002 as part of the SNFPA (USDA 2001). Naïve occupancy rate results for marten from 2002-2014 show a slightly varied but consistent trend of occurrence over the reporting period sampled. The 2007 Long Term Status and Trend Monitoring Report noted that marten are more commonly detected on Sierra National Forest than on Sequoia National Forest, and that the number of marten detections reported on the west slope of Sequoia NF south of Tulare County line quickly decrease (USDA 2007). These results would seem to support findings by Kurcera (1995) which noted limited to negative survey results for marten at the southern extent of Tulare County and within Kern County (pers. Comm. R. Truex 2010). Long term status and trend monitoring stations within the vicinity of the Tobias Project area are diplayed in Figure 25. No martens were detected in the Tobias Project Area, or additional District track plate and camera surveys conducted. The closest detections of marten was recorded on the west slope of the Greenhorn Mountains appoximately a half a mile of the Tobias Project Area boundary.

Species Biology and habitat preferences: Species Biology and habitat preferences: Marten are most commonly assoicated with moist mature conifer forests interspersed with meadows, providing abundant small mammal prey, features for resting and denning, and sufficient canopy coverage for protection (Buskirk and Ruggiero 1994). The California Wildlife Habitat Relationships (CWHR) model show moderately to highly important habitat types for marten as: red fir, lodgepole pine, subalpine conifer, mixed conifer, Jeffrey pine, white fir, montane hardwood-conifer, and eastside pine (CWHR 2005) with size and density classifications of: 4M, 4D, 5M, 5D, and 6. Using the CWHR Model, there are an estimated 151,340 acres of suitable habitat in the Western Divide Ranger District, with an estimated 2,064 acres of suitable habitat within the Tobias Project area.

Buskirk and Powell (1994) suggested that marten utilize stands that are structurally complex and that have denser (although not uniform) overhead canopy cover. Many studies suggest that marten most commonly use stands exceeding 40% canopy. Martens can inhabit younger forests if important elements of the mature forest are still present, especially structures for resting and denning (Purcell et al. 2012, Zielinksi 2013). Riparian habitats adjoining mature forest, are important for foraging (Zielinksi 2013). The abundant large trees and dead-wood structures associated with marten presence provide prey resources, resting structures, and escape cover (Zielinksi 2013). Rest structures typically include snags, logs, and stumps; trees and snags used for resting are often the largest available (>35 inches in diameter) (Purcell et al. 2012).

Rest structures can vary with season of use with above-ground cavities are used in summer and subnivean logs, snags, and stumps used during the winter (Zielinski 2013). Den structures typically include arboreal cavities in live trees, snags (Gilbert et al. 1997, Raphael and Jones 1997, Bull et al. 2005) and logs, rock crevices and squirrel middens (Ruggiero et al. 1998). Resting and denning structures may be the most limiting resource for marten on the landscape since this species uses multiple structures within their ranges (Purcell et al. 2012).

Figure 25. Long Term Carnivore Monitoring Stations and Results for Marten From 2002-2014 (J.Tucker 2015).



The SNFPA FEIS (USDA 2001) offered tentative estimates for key structural components thought to be important for marten in west side suitable habitats (Table 31). Den and rest sites are thought to occur in forest patches with denser canopy cover and higher numbers of large old trees. These patches may exist in scattered distribution across the landscape and exceed canopy and size class levels found throughout the majority of the surrounding suitable habitat. Foraging habitat tolerance is believed to be more open with canopy cover ranging from 40 percent or higher.

Table 31. Tentative Estimates for Key Structural Components Important for Marten (SNFPA FEIS, USDA 2001).

Habitat Element	Westside Habitats	
	Travel/Forage	Denning/Resting
Canopy Cover	>=40%	>=70%
Largest Live Conifers	>=24"dbh, >=6/acre	>=24"dbh, >=6/acre
Live Tree Basal Area		163-350 sq ft/acre
Largest Snags	Ave 2.5/acre >=24" dbh	Ave 5.0/acre >=24" dbh
Coarse Woody Debris	Largest logs (>15 ft long) for 5-10 tons/acre in Decay Classes 1-3	Largest logs (>15 ft long) for 5-10 tons/acre in Decay Classes 1-2

At the landscape scale, patches of preferred habitat and the distribution of open areas with respect to these patches may be critical to the distribution and abundance of martens (Buskirk and Powell 1994). Small open areas, especially meadows, and regenerating stands (or plantations) are used by marten as foraging habitat, but these openings are of optimum value when they occupy a small percent of the landscape and occur adjacent to mature forest stands meeting requirements for den or rest habitat.

Martens appear to avoid landscapes with greater than 25 to 30 percent of the area in openings, even where suitable habitat connectivity exists (Chapin et al. 1998, Hargis et al. 1999). Fuller and Harrison (2005) found marten use declined when 25 to 40 percent of the area was comprised of regenerating forest. There appears to be a threshold (>25 percent openings) where opening creation may become detrimental, resulting in marten abandonment of the area (Hargis et al. 1999), at least until these stands regenerate dense overhead canopy cover. Review of habitat conditions within the Tobias Analysis area suggest it likely represents low habitat capability for the marten due to the effects of the Stormy Fire. Presently an estimated 60% of the analysis area is comprised by brush types.

Home Range and Reproduction: Home range areas for marten in the southern Sierra Nevada (Sequoia, Sierra, and Stanislaus National Forests) were estimated at 254 acres for females and 807 acres for males (values expressed as mean of two home range estimating techniques: 95% minimum convex polygon, and adaptive kernel)(USDA 2001). Marten give birth to their young between mid-March and late April. A variety of structures are used for dens, which include cavities in large trees, snags, stumps, logs, burrows, caves, and rocks. In most cases involving standing trees, logs and snags, dens were found in large structures. Canopy cover and the number of large old trees in these patches typically exceed levels available in surrounding habitat. The availability of habitat suitable for natal dens may limit reproductive success and recruitment (Buskirk and Ruggiero 1994).

Prey Resources: Marten are dietary generalists and opportunistic in their foraging strategy (Ruggeriero et al. 1994, Buskirk et al. 1994, USDI 2004). Some authors suggest that their ability to adjust predatory patterns and prey type are important factors that enable them to balance energetic needs (Buskirk and Powell 1994). Marten eat a wide diversity of prey items, which include small to mid-sized mammals (voles (*Microtus* spp.), Douglas squirrels (*Tamiasciurus douglasii*), deer mice (*Peromyscus* spp.) birds, insects (wasps, hornets and yellow jackets), fruits and nuts, vegetation, and carrion. Various studies in the Sierra Nevada indicate that martens have a strong preference for use of forest-meadow edges, and riparian forests appear to be important foraging habitats (Spencer et al. 1983, Martin 1987).

Risk Factors: Marten are sensitive to habitat loss and fragmentation and rarely occupy landscapes after >30% of the mature forest has been harvested (Zielinksi 2013). Martens tend to avoid clear cut openings or will cross only small openings (e.g., < 500 feet). However, openings that have some structure retained (e.g., isolated trees, snags, logs), were more likely to be crossed by marten in the Rocky Mountains, even if the openings were relatively large (maximum distance = 600 feet), than if the opening had no structures and were small (summarized in Zielinksi 2013). Females tend to be more specialized than males in their habitat needs and tend to avoid managed areas of lesser habitat value and greater predation risk (summarized in Zielinski 2013).

Townsend's Big-eared Bat (*Corynorhinus townsendii*)

State Wide Range, Distribution, and Trend: Historically the Townsend's big-eared bat was found throughout California as a scarce, but widespread species (Barbour and Davis 1969). It is noted to occur from low desert (sea level) to mid-elevation montane habitats, with only occasional sightings reported up to 10,800 feet (Philpott 1997).

Limited inventories conducted on Sequoia National Forest for the Townsend's big-eared bat suggest a scattered presence of this species. The greatest abundance has been noted primarily at abandoned silver and tungsten mines in low elevation areas of the Kern River drainage, and in the Windy Gulch Cave Complex. Recent field reconnaissance solely for the purpose of identification of bat species has not been conducted within the Tobias Project. However, one previous historic survey was completed within the Deep Creek Cave by Brown (1997, unpublished survey report). The survey noted the presence of *Corynorhinus* guano in a few secluded spots, and that the cave had historic records of the species.

Species Biology and habitat preferences: Habitat associations for this bat species include desert, native prairies, coniferous forests, mid-elevation mixed conifer, mixed conifer-hardwood forests, riparian communities, active agricultural areas and coastal habitat types (Kunz and Martin 1982, Pierson et al. 1991). Roost structure is believed to be more important than the local vegetation (Gruver and Keinath, 2006; Pierson and Rainey 1998) and the presence of suitable caves or cave-like structures defines the distribution of this species more so than does suitable foraging habitat (Barbour and Davis 1969; Pierson and Rainey 1998; Piaggio 2005; Gruver and Keinath 2006. The majority of the Tobias Project Area provides suitable foraging habitat for the Townsend's big-eared bat estimated at 10,826 acres.

The most critical habitat feature for roost sites and maternity colonies are cave and cave-like roosting structures such as: mines, attics in buildings, lava tubes, and bridges. Mating typically occurs from November to February after bats have entered their hibernaculum for the winter (Barbour and Davis 1969; Burt and Grossenheider 1980; Jameson and Peeters 1988; Kunz and Martin 1982; Zeiner et al. 1990). Females give birth to a single pup in May or June (ibid.). Young are weaned in six weeks, and can fly two-and-a-half to three weeks after birth (ibid). Caves and mine tunnels are most commonly used as maternity sites, as well as for winter hibernacula.

Moths are the primary prey of Townsend's big-eared bat making up over 90 percent of the diet (Piaggio 2005). Pierson et al. (1999) summarized other research that includes consumption of other invertebrate orders in small amounts. Small moths, beetles, and a variety of soft-bodied insects are taken in flight using echolocation, or by gleaning from foliage (Jameson and Peeters 1988; Zeiner et al. 1990). This bat will forage above and within the canopy (Pierson et al. 1999), often along forest edges and riparian areas (Piaggio 2005), and seems to be well adapted to a moderately cluttered canopy (Gruver and Kenaith 2006). Foraging habitat in California includes agricultural types, dense forests, desert scrub, moist coastal forests, oak woodlands, and mixed conifer-deciduous forests (Pierson and Rainey 1998), in particular along habitat edges (Fellers and Pierson 2002).

Risk Factors: The largest emerging threat to all cave-roosting species is white-nose syndrome. There is a grave concern that it could spread to the western states and California. This disease has rapidly spread throughout the eastern US and Canada since its discovery in 2006 as far west as Oklahoma. Other threats to Townsend's big-eared bats include disturbance or destruction of roost sites, in particular hibernacula and nursery sites (Pierson et al. 1999; Piaggio 2005; Woodruff and Ferguson 2005; Bradley et al. 2006). Visitation during critical periods can adversely affect bats in those sites, often leading to reduced populations (Pierson et al. 1999). Mine closures, often with the intent to protect human safety, can eliminate access to roosts and hibernacula (Miner and Stokes 2005). Reactivation of mines may eliminate cave roosts and hibernacula, or cause disturbance such that bats will abandon a site (Pierson et al. 1999).

Pallid bat (*Antrozous pallidus*)

State Wide Range, distribution and Trend: The pallid bat is a locally common species of low elevation regions in California. It is broadly distributed except for the high Sierra Nevada from Shasta to Kern Counties, and the northwestern corner of the State from Del Norte and western Siskiyou Counties to northern Mendocino County. The species occurs on all Sierra Nevada national forests. Pallid bats are presumed present in low density within their elevation range.

Habitat Preferences and Biology: The pallid bat occupies a wide variety of habitats ranging from rocky arid deserts to grasslands, shrublands, woodlands, and forests from sea level up to mixed conifer forests. They are most abundant in the arid Sonoran life zones below 6,560 feet (Barbour and Davis 1969, Hermanson and O'Shea 1983). Data suggests a stronger association with low to mid elevation oak habitat (both oak savannah and black oak), mixed deciduous/coniferous forest, and both coast redwood and giant sequoia forests (Pierson and Heady 1996, Pierson et al. 2006). They are yearlong residents in most of their range and hibernate in winter near their summer roost (Zeiner et al.1990). Occasional forays may be made in winter for food and water (Philpott 1997). Based on CWHR habitat classification of vegetation types (size and density) for the pallid bat there is approximately 10,892 acres of habitat in the Tobias Project Area.

The pallid bat tends to be a roosting habitat generalist that utilizes many different natural and manmade structures (USDA 2001). Day roosts may vary but are commonly found in rock outcrops, crevices, tree hollows, mines, caves and a variety of human-made structures (bridges, buildings). Tree roosting has been documented in large conifer snags, inside basal hollows of live coastal redwoods and giant sequoias, and bole cavities in oaks. Cavities created by broken branches of black oak are very important and there is a strong association with black oak for roosting. Night roosts are usually more open sites and may include open buildings, porches, mines, caves, and under bridges (Philpott 1997, pers. comm. Sherwin 1998, Pierson et al. 1996).

Mating takes place between late October and February. Pallid bats reproduce in nursery colonies of up to several hundred females, but generally fewer than 100. After a period of delayed fertilization, gestation occurs between April and June. On average 2 young are born between April and July, predominately May and June.

Prey Resources: Pallid bats are thought to prefer open habitat for foraging. They feed primarily on large, ground-dwelling arthropods, particularly beetles, Jerusalem crickets and scorpions (Pierson et al. 2006). Large moths and grasshoppers are consumed to a lesser degree. Pallid bats appear to be more prevalent within edges, open stands, particularly hardwoods, and open areas without trees (CWHR 2005).

Risk Factors: The largest emerging threat to all cave-roosting species is white-nose syndrome. There is a grave concern that it could spread to the western states and California. This disease has rapidly spread throughout the eastern US and Canada since its discovery in 2006 and has moved as far west as Oklahoma. Habitat threats include loss of foraging habitat due to urban expansion in low elevation habitat (Philpott 1997; Ferguson and Azerrad 2004; Rambaldini 2005; Miner and Stokes 2005) and loss of riparian habitat in arid areas.

Fringed Myotis Bat (*Myotis thysanodes*)

State Wide Range, distribution and Trend: The fringed myotis bat is found throughout the state California except the Central Valley and the Colorado and Mohave Deserts, from the coast (including Santa Cruz Island) to greater than 5,900 feet in elevation in the Sierra Nevada. Records exist for the high desert and east of the Sierra Nevada. However, the majority of known localities are on the west side of the Sierra Nevada (Angerer and Pierson draft). Museum records suggest that while *M. thysanodes* is widely distributed in California, it is one of the rarest species detected (Pierson et al. 1996).

Habitat Preferences and Biology: The fringed myotis bat occurs in dry woodland, hot desert-scrub, grassland, sage-grassland steppe, spruce-fir, coniferous and mixed deciduous/coniferous forests, including multi-aged sub-alpine, Douglas fir, redwood, and giant sequoia (O’Farrell and Studier 1980, Pierson and Heady 1996, Pierson et al. 2006, Weller and Zabel 2001). To generalize, this species is found in open habitats that have nearby dry forests and an open water source (Keinath 2004). Based on CWHR classification of vegetation types associated with the fringed myotis bat, there is estimated at 10,804 acres of suitable habitat in the Tobias Project area.

This species has been associated with a variety of roost site types and structures. These include rock crevices (Cryan 1997), caves (Baker 1962, Easterla 1966, 1973), mines (Cahalane 1939, Cockrum and Musgrove 1964), buildings (Barbour and Davis 1969, O’Farrell and Studier 1980), bridges, and both live and dead trees. Day and night roosts in trees occur under bark, in tree hollows, and in snags of medium to large diameter (Keinath 2004; Weller and Zabel 2001). Studies conducted in California, Oregon, and Arizona, have documented roosts in tree hollows, particularly in large conifer snags (Chung-MacCoubrey 1996, Rabe et al. 1998, Weller and Zabel 2001, Pierson et al. 2006). Most of the tree roosts were located within the tallest or second tallest snags in the stand, were surrounded by reduced canopy closure, and were under bark (ibid.).

This species often forages along secondary streams, in fairly cluttered habitat. It also has been captured over meadows (Pierson et al. 2001). The fringed myotis bat is known to fly during colder temperatures (Hirshfeld and O’Farrell 1976) and precipitation does not appear to affect emergence (O’Farrell and Studier 1975). Post-lactating females have been known to commute up to 13 km (8 miles) with a 930 meter (3,100 feet) elevation gain between a roost and foraging area (Miner and Brown 1996). Keinath (2004) found that travel distances from roosting to foraging areas may be up to five miles.

The fringed myotis consumes primarily beetles, and is supplemented by moths and fly larvae (Keinath 2004) captured in the air and on foliage (CWHR 2008). Their diet also includes phalangids (harvestmen), gryllids (crickets), tipulids (crane flies), and araneids (spiders).

Risk Factors: The largest emerging threat to all cave-roosting species is the fungal disease white-nose syndrome (WNS). Massive die-offs result once a colony is infected. There is grave concern that it could spread to the western states and California. This disease has rapidly spread throughout the eastern US and Canada since its discovery in 2006, and as expanded as far west as Oklahoma.

M. thysanodes appears to be highly dependent on tree roosts within forest and woodland habitats. In some forested settings, *M. thysanodes* appears to rely heavily on tree cavities and crevices as roost sites (Weller 2005), and may be threatened by certain harvest practices. For example, Chung-MacCoubrey (1996) in Arizona found that this species prefers large diameter (18-26 inch dbh) conifer snags. Other risk factors include closure of old mines for hazard abatement and renewed mining in historic districts. Both pose considerable risks to this and other cavern dwelling bat species (Altenbach and Pierson 1995). Further, improper gating may alter accessibility to and from mines and caves.**)**

MANAGEMENT INDICATOR SPECIES

According to the *Management Indicator Species Report for the Tobias Ecosystem Restoration Project* (MIS Report) (Galloway 2015b), Management Indicator Species (MIS) are animal species identified in the Sierra Nevada Forests MIS Amendment Record of Decision (ROD) signed December 14, 2007 (SNF MIS Amendment) (USDA 2007). Guidance for Forest Service resource managers regarding MIS is to: (1) at the project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects, and (2) at the bioregional scale, monitor populations and/or habitat trends of MIS.

Project-level effects on MIS habitat involves examining the effects of the proposed project alternatives on MIS habitat by discussing how direct, indirect, and cumulative effects will change the habitat in the analysis area.

These project-level effects to habitat are then related to broader scale (bioregional) population and/or habitat trends. The appropriate approach for relating project-level effects to broader scale trends depends on the type of monitoring identified for MIS in the forest level planning document. Hence, the Sequoia National Forest Plan identifies distribution population monitoring for an MIS, and the project-level habitat effects analysis for that MIS is informed by available distribution population monitoring data, which are gathered at the bioregional scale. The bioregional scale monitoring identified in the Sequoia National Forest Plan for MIS analyzed for the Tobias Project is summarized in Section 3 of the MIS Report.

MONITORING REQUIREMENTS FOR MIS SELECTED FOR PROJECT-LEVEL ANALYSIS

The SNF MIS Amendment (USDA 2007) identifies bioregional scale habitat and/or population monitoring for the MIS for ten national forests, including the Sequoia. The applicable habitat and population monitoring requirements and results for the Sequoia’s MIS are described in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a) and are summarized below for the MIS being analyzed for the Tobias Project.

Habitat monitoring at the bioregional scale is identified for all the habitats and ecosystem components, including the following analyzed for the Tobias Project: shrubland; early seral coniferous forest; mid seral coniferous forest; late seral open canopy coniferous forest; late seral closed canopy coniferous forest; and snags in green forest.

Populations of mountain quail, sooty grouse, California spotted owl, American marten, northern flying squirrel and hairy woodpeckers are monitored at the bioregional scale using distribution population monitoring. Distribution population monitoring consists of collecting presence data for the MIS across a number of sample locations over time (also see USDA Forest Service 2001, Appendix E). The MIS vegetation types in the Tobias Project area are described in Table 32.

Table 32. MIS Vegetation Types in the Tobias Analysis Area and Treatment Areas.

MIS Vegetation Types	Tobias Analysis Area (approximate acres)*	Tobias Project Treatment Acres
Riverine & Lacustrine	1	0
Shrubland (west-slope chaparral types)	6,633	2,517
Oak-associated Hardwoods & Hardwood/conifers	480	0
Riparian	0	0
Wet Meadow	95	0
Early Seral Coniferous	1,232	768
Mid Seral Coniferous	1,526	961
Late Seral Open Canopy Coniferous	152	24
Late Seral Closed Canopy Coniferous	712	600
***All acres are estimates derived through GIS mapping technology.**		

Management Indicator Species (MIS) for the Sequoia NF are identified in the 2007 Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment (USDA Forest Service 2007a). The habitats and ecosystem components and associated MIS analyzed for the Tobias Project were selected from this list of MIS, as indicated in Table 32. In addition to identifying the habitat or ecosystem components (1st column), the CWHR type(s) defining each habitat/ecosystem component (2nd column), and the associated MIS (3rd column), the Table discloses whether or not the habitat of the MIS is potentially affected by the Tobias Project (4th column).

The following MIS habitats occur within the analysis area (Bull Run Basin), but are not affected by the Tobias Project: Riverine and Lacustrine, Riparian, Wet Meadow, and Snags in Burned Forest.

Riverine and Lacustrine (LAC & RIV): This habitat does not occur within the project area.

Riparian habitat (MRI & VRI): None occurs within the project area and this habitat would not be directly or indirectly affected by the project.

Wet Meadow (WTM): There is wet meadow habitat within the project area but this habitat would not be directly or indirectly affected by the project.

Oak-associated Hardwood & Hardwood/conifer (MHW and MHC): These habitats are found within the project area but would not be directly or indirectly affected by the project.

Additionally one ecosystem component, "snags in burned forest", was not found to be relevant to the Tobias Analysis. The "snags in burned forest" component addresses project effects on the burned forests for the black-backed woodpecker. The black-backed woodpecker is specific to the use of recently burned forests (Bond et al. 2012). The Stormy Fire while evident in the project analysis area occurred over 25 years ago, and would not provide suitable habitat for the species. Proposed pile and burn, jackpot pile burning and limited under burning would not be of a scale that would serve as an attractant for the species. The current range map for this species as identified by CWHR also does not overlap with the Tobias Project area and therefore was not addressed as a Category 3 species.

The MIS whose habitat would be either directly or indirectly affected by the Tobias Project, identified as Category 3 in Table 33 (see MIS Report for full discussion), are carried forward in this analysis, which will evaluate the direct, indirect, and cumulative effects of the proposed action and alternatives on the habitat of these MIS. The MIS selected for project-level MIS analysis for the Tobias Project are: fox sparrow, mountain quail, sooty grouse, California spotted owl, American marten, northern flying squirrel, and hairy woodpecker.

Table 33. Selected MIS for Tobias Project-level Habitat Analysis

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component[1]	Sierra Nevada Forests Management Indicator Species	Category for Project Analysis [2]
Shrubland (west-slope chaparral types)	montane chaparral (MCP), mixed chaparral (MCH), chamise-redshank chaparral (CRC)	fox sparrow *Passerella iliaca*	3
Early Seral Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), Jeffrey pine (JPN), tree sizes 1, 2, and 3, all canopy closures	mountain quail *Oreortyx pictus*	3
Mid Seral Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), Jeffrey pine (JPN), tree size 4, all canopy closures	mountain quail *Oreortyx pictus*	3
Late Seral Open Canopy Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), Jeffrey pine (JPN), tree size 5, canopy closures S and P	sooty grouse *Dendragapus obscurus*	3
Late Seral Closed Canopy Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), Jeffrey pine (JPN), tree size 5 (canopy closures M and D), and tree size 6.	California spotted owl *Strix occidentalis occidentalis*	3
		American marten *Martes americana*	

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component[1]	Sierra Nevada Forests Management Indicator Species	Category for Project Analysis [2]
		northern flying squirrel *Glaucomys sabrinus*	
Snags in Green Forest	Medium and large snags in green forest	hairy woodpecker *Picoides villosus*	3
[1] All CWHR size classes and canopy closures are included unless otherwise specified; **dbh** = diameter at breast height; **Canopy Closure classifications:** S=Sparse Cover (10-24 percent canopy closure); P= Open cover (25-39 percent canopy closure); M= Moderate cover (40-59 percent canopy closure); D= Dense cover (60-100 percent canopy closure); **Tree size classes:** 1 (Seedling)(<1" dbh); 2 (Sapling)(1"-5.9" dbh); 3 (Pole)(6"-10.9" dbh); 4 (Small tree)(11"-23.9" dbh); 5 (Medium/Large tree)(≥24" dbh); 6 (Multi-layered Tree) [In PPN and SMC] (Mayer and Laudenslayer 1988). [2] **Category 3:** MIS whose habitat would be either directly or indirectly affected by the project.			

Fisher (*Pekania pennatti*)

FISHER LEGAL STATUS

In March 2013, the USFWS initiated a status review as part of a multidistrict litigation settlement agreement under which the Service agreed to submit a proposed rule or a not-warranted finding to the Federal Register for the West Coast Distinct Population Segment (DPS) of the fisher no later than the end of Fiscal Year 2014 (*In re Endangered Species Act Section 4 Deadline Litigation*, Misc. Action No. 10-377 (EGS), MDL Docket No. 2165 (D.D.C.). In October 2014, a proposed rule to list the West Coast DPS of fisher as threatened under the Endangered Species Act was published in the Federal Register (Federal Register Vol. 79 No. 194), with a final decision expected April 2016.

Southern Sierra Nevada Population Status and Trend

Patterns of detection within the southern Sierra Nevada fisher population suggest fisher are well distributed on the west-slope of Sequoia NF, from the Kings River south through the Greenhorn Mountains. Annual rates of occupancy (i.e., proportion of sites sampled that detected fisher) are generally consistent, and the spatial distribution of detections is more consistent from year to year than elsewhere in the southern Sierra. This area has been consistently occupied since surveys began in earnest during the early 1990s.

Status and trend monitoring for fisher was initiated in 2002 as part of the Sierra Nevada Forest Plan Amendment FEIS; the monitoring objective is to be able to detect a 20% decline in population occupancy (USDA-FS, 2006a). This monitoring includes intensive sampling to detect population trends on the Sierra and Sequoia national forests, where fisher currently occur, and is supplemented by less intensive sampling in suitable habitat in the central and northern Sierra Nevada specifically designed to detect population expansion. From 2002-2014, 456 sites were surveyed throughout the Sierra Nevada on 1,861 sampling occasions, with the bulk of the sampling effort occurring within the Southern Sierra fisher population monitoring study area (USDA-FS, 2014). Results are displayed in Table 34.

Table 34. Proportion of sites occupied in the Sequoia and Sierra National Forests.

Year	Sequoia NF West Slope	Sequoia Kern Plateau*	Sierra NF	Entire Area
2002	0.54	0.11	0.19	0.27
2003	0.52	0.13	0.18	0.25
2004	0.41	0.23	0.16	0.22
2005	0.45	0.26	0.16	0.24
2006	0.64	0.19	0.21	0.31
2007	0.60	0.23	0.18	0.28
2008	0.43	0.14	0.21	0.25
2009+	0.57	0.46	0.16	0.25
2011	0.50	0.29	0.33	0.36
2012	0.57	0.22	0.18	0.27
2013	0.55	0.15	0.19	0.27
2014	0.54	0.34	0.27	0.35

(Updated 3/11/2010) *USDA Forest Service 2009, Truex et al. 2009, Truex, pers. comm.. 2010. Geographic areas are defined as Sequoia NF West Slope (including Hume Lake Ranger District), Sequoia Kern Plateau (the Kern Plateau portion of Sequoia National Forest), and Sierra (Sierra National Forest). Habitat availability and detection rates on the Kern Plateau may be affected by habitat loss due to large fires. In 2007 the SQF West Slope sampling included one unit in Sequoia National Park, and the Sierra NF included six units in Yosemite National Park.

+ Sampling effort during 2009 was reduced on the Kern Plateau due to safety and operational considerations. Sampling was limited to the northern portion of the plateau and the observed occupancy is likely higher than it would otherwise have been if sampling had occurred throughout the area as in previous years (Truex, pers. comm.). Sampling effort in 2014 included 13 new units not previously surveyed which may have increased occupancy estimates for this year.

Analysis of the SNFPA Long Term Monitoring data was completed which analyzed a core of 243 sample units from 2002 through 2009 (Zielinski et. al 2013). Findings suggest that over the 8-year period, there was no trend or statistically significant variation in fisher occupancy rates in the southern Sierra populations; however, given the variety of continuing risk factors, continued monitoring is highly favored.

Project Level Status

Surveys for fisher within the Tobias project area have been conducted through a variety of efforts. There are sample units for the Southern Sierra Nevada Fisher and Marten Status and Trend Monitoring Project in the vicinity (USDA-FS, 2014). This project conducts systematic surveys across the National Forests of the Sierra Nevada to track the status and trend of carnivore populations, specifically fisher and marten (*Martes americana*). There have been numerous fisher detections both within the Tobias Project area and in adjacent areas (Figure 26). NRIS Wildlife documents fisher detections only from 1991 to 2009 in this area.

Habitat Relationships

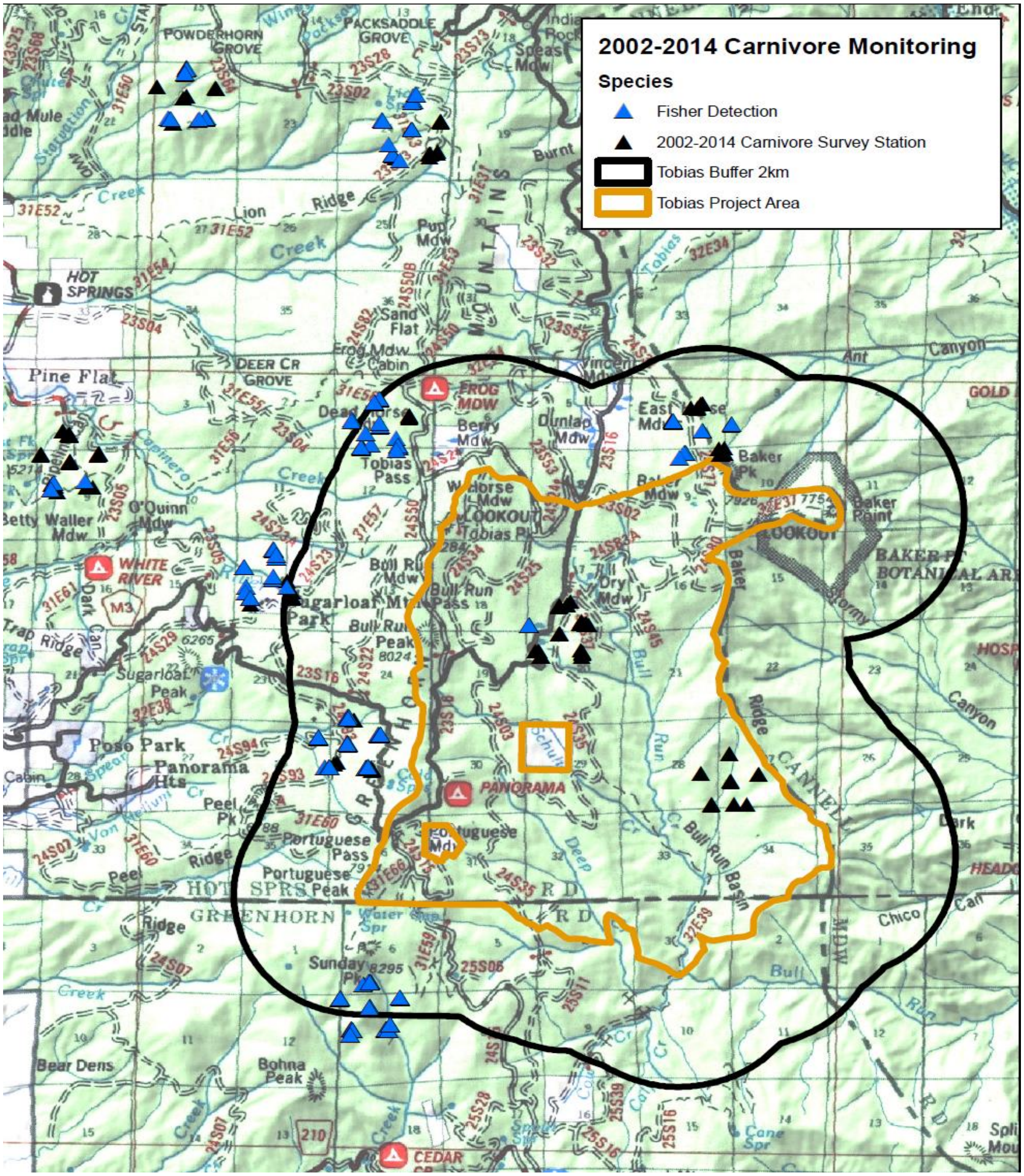
Fishers use large areas of primarily coniferous forests with fairly dense canopies and large trees, snags, and down logs. A vegetated understory and large woody debris appear important for their prey species.

It is assumed that fishers will use patches of quality habitat that are interconnected by other forest types, whereas they will not likely use patches of habitat that are separated by large open areas lacking canopy cover (Buskirk, et al., 1994). Buck et al. (Buck, et al., 1994) described 1970s research in managed Douglas-fir and white fir forests in northwestern California. They detected a selection pattern favoring residual stands of mature forest in areas heavily harvested for timber.

Riparian corridors (Heinemeyer, et al., 1994) and forested saddles between major drainages (Buck, 1983) may provide important dispersal habitat or landscape linkages for the species. Riparian areas are important to fishers because they provide concentrations of large rest site elements, such as broken top trees, snags, and coarse woody debris (Seglund, 1995), perhaps because they persisted in the mesic riparian microtopography through historic fires.

Habitat suitable for resting and denning sites is thought to be most limiting to the population; therefore, these habitats should be given more weight than foraging habitats when planning or assessing habitat management (Powell, et al., 1994), (Zielinski, et al., 2004b). Fishers generally use at least one rest site per day, and rarely reuse rest site structures (Kilpatrick, et al., 1994) (Seglund, 1995) (Zielinski, et al., 2004b). Zielinski et al. (2004b) argue that retaining and recruiting trees, snags and logs of at least 39 in. dbh, encouraging dense canopies and structural diversity, and retaining and recruiting large hardwoods are important for producing high quality fisher habitat and resting/denning sites. Freel (1991) also recommended 2 snags per acre over 44” dbh and 4-5 snags per acre over 20”dbh for suitable fisher habitat.

Figure 26. Southern Sierra Nevada Fisher Status and Trend Monitoring Sample Survey Units in the Proximity of the Tobias Project Area with results displayed from 2002-2014.



Southern Sierra Nevada Fisher Habitat

General. Habitat is largely restricted to a narrow north-south band on mostly western slopes of mid-elevation forests in the southern Sierra Nevada mountains (Spencer, et al., 2008). It is associated with mesic topographic positions (northern slopes) in areas of lower precipitation (less persistent snow cover), and is concentrated in or near large old stands of mixed conifer, sequoia, and ponderosa pine, especially areas with black oak (Spencer, et al., 2008).

Mazzoni (Mazzoni, 2002) studied habitat use by fishers in the Kings' River Project (KRP) (southern Sierra Nevada). Ninety percent of fisher rest sites were in large live trees (mean dbh = 37") and large snags (mean dbh = 40"). Large logs as well as stumps and rock crevices were also used for resting. Selection for resting in white fir, ponderosa pine and black oak was evident, and selection against incense cedar and sugar pine was documented. Compared to random sites, areas of 2.47 acres surrounding rest sites had greater levels of canopy, coarse woody debris, basal area, crown volume and canopy layering. Rest sites were closer to water than random sites, and Mazzoni (2002) suggests this may be an artifact of riparian buffers that retain large structural elements of the habitat and dense canopy. The importance of ecological processes such as decay and disease, especially mistletoe brooms, are highlighted for creating fisher rest structures. This has also been documented in other portions of the fisher's range (Paragi, et al., 1996) (Parks, et al., 1999). Zielinski et al. (2004b) found that female rest sites, when compared to random sites, included denser canopies, larger trees, steeper slopes, and greater presence of large conifer snags.

Den Site Selection.

Den site structural elements must exist in the proper juxtaposition within specific habitats in order to provide a secure environment for birth and rearing of fisher kits. Natal dens, where kits are born, are most commonly found in tree cavities at heights of greater than 20 feet (Lewis, et al., 1998). Maternal dens, where kits are raised, may be in cavities closer to the ground so active kits can avoid injury in the event of a fall from the den (Lewis, et al., 1998).

Den tree data collected in the KRP area on the Sierra National Forest between 2007 – 2010, (Thompson, et al., 2011) included use of black oak, white fir, incense cedar, ponderosa pine, and sugar pine. Live black oaks selected as maternal den sites were among the largest oaks used and averaged 34.2" dbh, while oaks used as maternal den sites were much smaller and averaged 23.6" dbh. Live conifers used as natal dens averaged 45.2", while those used as natal dens were smaller, averaging 37.9" dbh. Forty-four of 93 maternal and natal dens (47%) were in black oaks, which do not typically leaf out until mid–late May, thus providing little canopy cover during actual use periods. Selection of these sites may be driven by their location and associated access to warming morning sun (K. Purcell, pers. comm.) (C. Thompson pers. comm.). All confirmed births through the 2008 field season occurred between 30 March and 11 April, and natal dens were occupied for 2 to 8 weeks.

In 2007 and 2008, den sites in the KRP area occurred in Sierran mixed conifer, montane hardwood-conifer and ponderosa pine forest types (K. Purcell, pers. comm.). Black oak was strongly selected as the den tree (C. Thompson pers. comm.). On the KRP study area, natal dens (n=7) averaged 46 feet high with a range of 6 to 110 feet (K. Purcell, pers. comm.). Maternal dens (n=7) on the KRP averaged 21.6 feet high, with a range of 9 to 41 feet (K. Purcell, pers. comm.). Generally, natal dens were found to be larger than maternal dens, only 1 hardwood snag was used, and conifer snags appear to be used more as maternal dens (K. Purcell, and C. Thompson, pers. comm.). As of 2009, average canopy cover was 74.3% (SD = 12.4, range 47.5 – 99.0, n = 51). Moosehorn readings at 2, 5, 10, and 15 m, in 4 directions were averaged to measure canopy cover (K. Purcell, and C. Thompson, pers. comm.).

As of 1998 (Truex, et al., 1998), natal dens in the Southern Sierra were located in white fir or black oak. Subsequently, most natal and maternal dens were in large conifers (white fir, sugar pine or ponderosa pine in southern Sierra) or oaks (California black oak in southern Sierra), generally in live form (Truex, et al., 1998), (Mazzoni, 2002), (Zielinski, et al., 2004b). All natal dens were established during the last week of March or the first week in April and were occupied for 4 to 7 weeks. The canopy closure surrounding these den trees ranged from 89% to 97%, measured by spherical densiometer (implying a bias on the high side for remotely sensed canopy coverage, as typically measured by the Forest Service). The mean dbh of dens in white fir was 49.4 inches, compared to only 26.3 inches in black oak. It is important to note the smaller dbh of oaks used as den trees, inferring that they achieve the requisite structural characteristics at smaller sizes than conifers. Similar information on tree species and size for natal and maternal den structures has been documented on the SNAMP project.

Rest Site Selection

General

Large diameter black oaks and canyon live oaks compose almost half of the rest sites used by fishers in the southern Sierra Nevada (Zielinski, et al., 2004b) while incense cedar were used less than expected. Purcell et al. (Purcell, et al., 2009) determined in the KRP study area, fisher rest sites (regardless of species) averaged 37.5 inches for live trees and 46.0 inches for snags. Additionally, from 2007 to 2011, rest sites of all trees in the KRP area averaged 34.9 inches dbh, ranging from 7.8 to 78.4 inches (n = 283). Conifers used as rest sites averaged 37.6 inches while hardwoods averaged 27.9 inches (C. Thompson pers. comm.).

Most resting structures used in the KRP area were in live trees (76%), 15% were in snags, 3 were in logs and 2 each were in stumps and rock crevices (Purcell, et al., 2009). Mean canopy cover as measured by moosehorn at rest sites was 73.7%, compared to random site canopy cover of 55.3% (Purcell, et al., 2009). The majority (88.5%) of rest sites were in habitat with at least 20% canopy cover (Mazzoni, 2002).

Resting trees were predominantly ponderosa pine and white fir. In the immediate vicinity of the selected resting structure, ponderosa pine was used more than expected, while incense cedar was used less than expected (Purcell, et al., 2009). Habitat at fisher resting sites had higher canopy cover, greater basal area of snags and hardwoods, and smaller and more variable tree sizes compared to random sites. Resting sites were also found on steeper slopes and closer to streams. Canopy cover was consistently the most important variable distinguishing rest and random sites (Purcell, et al., 2009).

Home Range Composition. Using data available at the time, Zielinski et al. (2004c) examined the vegetation composition of fisher home ranges in the southern Sierra Nevada as presented in the following paragraph. Since these figures are merely descriptions of information regarding home range composition selected relative to what is available, it should be noted that fishers may occupy areas that differ somewhat from values presented here. Additionally, the GIS data used in Zielinski et al. (2004c) lacked the spatial resolution to map small inclusions of shrub habitat within the greater mixed-conifer matrix. R. Truex (pers. comm.) believes that this fine grain heterogeneity is important from the perspective of prey diversity.

For the Sequoia National Forest, Sierran mixed conifer, ponderosa pine, and montane hardwood forest types comprised an average of 86% of the 12 (8 female and 4 male) fisher home ranges, with size-class 4 stands (11-24 in dbh) and canopy closure Class D (60-100% closure) comprising 61% and 66%, respectively, of the home ranges (Zielinski, et al., 2004c). CWHR size class 4 stands (11-24" dbh), dense canopy closure (greater than 60%), and Sierran Mixed Conifer forest types constituted the greatest proportion of home ranges for female fishers. Home ranges for both sexes, rarely had less than 15% Sierran mixed conifer, less than 5% area in CWHR size class 5 (greater than 24" dbh), or less than 53% dense canopy closure stands (dense stands included all size classes and vegetation types including live oak, plantation, and shrub layers). The montane hardwood type averaged 12% of home range areas for both sexes. For both sexes, CWHR size class 2 (1-6" dbh) stands comprised generally less than 3% of home ranges, and less than 10% of home ranges supported open canopies (25 to 39%).

Threats to Fishers in the Southern Sierra Nevada: A detailed discussion on threats that may impact individuals or that may have ramifications on the recovery of the species is provided in the Biological Evaluation for the Fisher. Potential threats include climate change, uncharacteristically severe wildfire, vegetation manipulation to reduce risk of uncharacteristically severe wildfire, habitat fragmentation or loss of connectivity, poisoning from illegal marijuana cultivation on Forest Service lands, and disease.

AQUATIC AND FISHERIES SPECIES

AFFECTED ENVIRONMENT

Stream and meadow habitats within the project area contain MYLF suitable habitat (Figure 27). Suitable habitat areas included all perennial and intermittent streams and all sizes of meadows. Meadows within 984 feet of another were included as MYLF habitat and stringer and small ¼ acre meadows were included as they provide connectivity of habitat for MYLF among watersheds and between streams in the project area. Riparian conservation areas (RCAs) are used for foraging and dispersal and the distance out from these important habitats to other meadows or streams was incorporated into the analysis area. Table 35 displays the acres of the different treatments across the alternatives for MYLF habitat (MH) and riparian conservation areas.

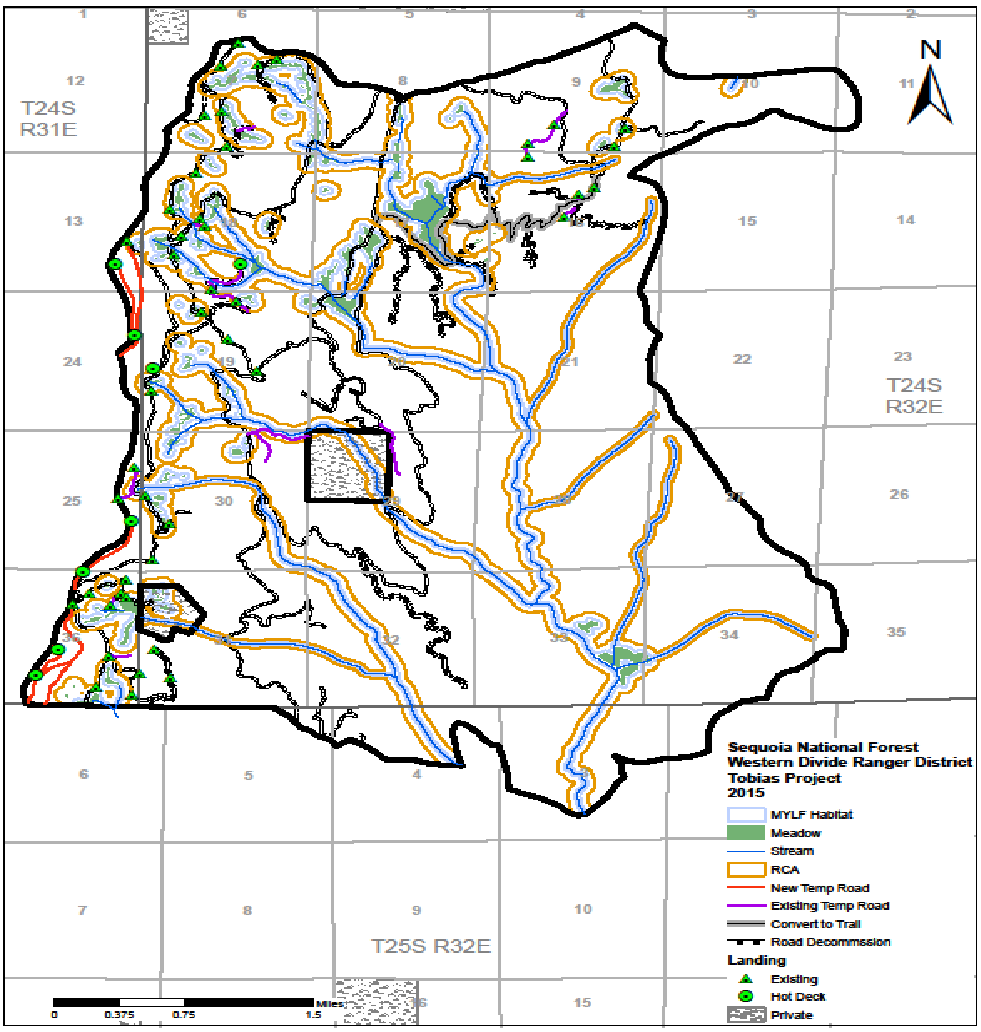
Table 35. Acres of activities for the three alternatives, within MYLF habitat and riparian conservation areas.

		Alt. 1	Alt. 2		Alt. 3	
Ground Disturbing Activity	**MH**	**RCA**	**MH**	**RCA**	**MH**	**RCA**
Total acres in project area	**1100**	**1420**	**1100**	**1420**	**1100**	**1420**
Hand or Mastication	0	0	0	341	0	507
Tractor	0	0	0	166	0	0
Skyline	0	0	0	46	0	0
Fuel Break	0	0	0	(38)	0	(38)
Temporary Road Re-opening	0	0	1	2.6	0	2.6
Road Decommission	0	0	2.3	3.9	2.3	3.9
New temp road	0	0	0	0	0	0
Landings	0	0	1	0	0	0
Crossing (new culvert)	0	0	0	0	0	0
Crossing (culvert removed)	0	0	0	0	0	0
Total Ground Disturbance	**0**	**0**	**3**	**560**	**2.3**	**514**
Fire Activity						
Hand & Jackpot Burn	0	0	0	270	0	316
Hand & Jackpot & Rx Burn	0	0	0	94	0	94
Backing Fire	0	0	77	0	0	0
Total Fire Activity	**0**	**0**	**77***	**364**	**0**	**410**

All values are in acres and exclude private property. Fire Activities may overlap other treatments.

MH = MYLF Habitat (100 ft. from edge of stream or meadow); RCA =RCA acres outside of MYLF breeding habitat (200 ft. or less from stream or meadow) but within foraging and dispersal habitat during certain seasons; Hand or Mastication refers to the area being proposed for mastication including 200 feet of the RCA. Some portion of this area will be hand treated; Hand and jackpot burn refers to hand treatment with pile burning or jackpot pile burning; Total area possible for backing fire in RCA is 364 acres but is unlikely to be more than 1/2 of this area due to the wetness of the RCAs during the time it is safe to burn and the area is in prescription in the fall; Backing fire acres (77 acres) represents total acres adjacent to intermittent streams *if no water is present. 1100 acres of MYLF habitat in the project area are proposed to have backing fire.

Figure 27. Stream and meadow habitats associated with MYLF and its suitable habitat.



Areas included all perennial and intermittent streams and meadows. Riparian conservation areas are in orange (varies with inner gorge). Existing landings closed 25 years ago are shown by green triangle

RECREATION

AFFECTED ENVIRONMENT

Nearly all visitors to the Sequoia National Forest, regardless of the purpose for their visit, use the motorized transportation system on the Forest to reach their destination. Making changes to the National Forest Transportation System (NFTS), such as changing or prohibiting motor vehicle use by vehicle type changes the diversity of motorized and non-motorized opportunities on the Forest. These visitors may be participating in motorized recreation or simply utilizing motorized vehicles to access non-motorized recreational activities to destinations or geographic areas.

Motorized recreation opportunities in the project area includes the use of highway-licensed cars, sedans, sport utility vehicles (SUVs), dual-sport motorcycles, off-highway vehicles (OHVs), motorcycles, all-terrain vehicles (ATVs), snowmobiles, and four wheel drive (4WDs). Known non-motorized recreational activities include hiking, dispersed camping, mountain bike riding, horseback riding, wildlife viewing, picnicking, hunting, and fishing. There is a one large dispersed camping area (Panorama).

Within the project area, there are 36 roads and 4 trails. There are approximately 43.5 miles of road. Currently 8.6 miles of road are open to the public for highway vehicles only and 28.5 miles of road are open to all vehicles, including non-highway legal vehicles (OHVs). About 6.2 miles of road is not available for public motorized use. There are 7.2 miles of system trails and all but one mile of trail is open to motorcycles.

Table 36. National Forest Transportation System Roads in Project Area

Route Number	Route Closed For public use.	Road Open to All Vehicles	Road Open Highway – Legal Vehicles Only
23S16			5.9
24S02			3.1
24S03		1.5	
24S08		1.3	
24S09		0.3	
24S10	0.7		
24S15			1.5
24S15A	0.4		
24S24			1.3
24S24A	0.6		
24S25		2.3	
24S25A	0.3		
24S25B	0.3		
24S28		0.5	
24S34		1.6	
24S34A		0.4	
24S35			8.2

24S35A	**0.8**		
24S35C	**1.4**		
24S37		**1.1**	
24S37A	**0.6**		
24S45	**0.5**		
24S45A	**0.3**		
24S46	**1.3**		
24S46A	**0.5**		
24S50			**1.1**
24S77	**0.8**		
24S80		**1.4**	
24S80A		**0.7**	
24S80B	**0.3**		
24S80C		**0.5**	
24S83		**1.4**	
24S83A	**0.8**		
25S37		**0.6**	
25S37A	**0.5**		
25S38A		**0.1**	
Grand Total	**10.1**	**8.1**	**21.1**

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

REASONABLY FORESEEABLE ACTIONS

Most past actions within this analysis area occurred long ago and are considered part of the affected environment for most resources. One project that was recently completed is the Camp Nelson Project. The Camp Nelson Project reduced surface and ladder fuels by thinning trees up to 10 inches diameter at breast height (dbh), and contributed towards desired conditions.

TRANSPORTATION AND ROADS

ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – NO ACTION

There would be no timber harvest, no vegetation treatment and no additional road maintenance in Alternative 1. Roads would be maintained under the scheduled road maintenance program and as funds are available. No additional road maintenance or road improvements would be done and roads not needed for future management would not be decommissioned to improve soil and water quality.

ALTERNATIVE 2 – PROPOSED ACTION

Direct and Indirect Effects

Alternative 2 road maintenance includes ongoing upkeep necessary to retain or restore the road to approved management objectives. Maintenance activities could involve hazard tree removal, cross drain construction and surface drain installation, culvert inlet armoring, minor culvert installation and replacement, drop inlet installation, catch basin cleaning and reshaping, roadside brushing, ditch cleaning, and surface grading. The intention of these activities is to maintain existing road features and to comply with best management practice standards. Maintenance would be performed to the standard of each road's assigned maintenance level. Maintenance costs on roads used for timber hauling would be included in the appraisal and road work would be done before, during, and after timber removal activities. System roads not associated with timber harvest activities would be maintained under the scheduled road maintenance program and as funds are available. Maintenance costs associated with roads used to access vegetation treatment areas would be provided with recurrent scheduled road maintenance funds. Under alternative 2, refer to the economics report for costs; Tables 3, 4, 5 display roads to be used. Road maintenance and drainage improvements associated with proposed activities would reduce erosion, sediment from roads, and benefit forest users. All harvest equipment operating off roads would be cleaned (pressure washed) and inspected before moving into the project area, to reduce risk of spreading noxious weed seeds onto disturbed areas. Areas affected by landings and skid trails would be scarified or ripped to mitigate compaction. Skid trails and landings would be cross-drained or recontoured where needed to mitigate erosion.

- Existing roads and landings would be utilized wherever possible. No new permanent system roads would be constructed for this project.
- Road would be maintained and graded as necessary to allow log trucks and equipment access using minimum disturbance methods and minimum clearing widths. Road maintenance activities would include brushing to improve site distance, maintaining existing cross-slopes on roads, maintenance of rolling dips and water-bars, cleaning ditches, culverts, and overside drains as needed.

- All skid trails constructed for harvest access would be decommissioned/obliterated and blocked by earthen barriers to prevent further access following harvest activities.
- Existing non-system roads in the project area may be used for harvest access only. These non-system roads are considered temporary, and if used for hauling would need to be rehabilitated/decommissioned and blocked by earthen barriers to prevent further access following harvest activities.
- Road and trail decommissioning and road reconditioning would be conducted during appropriate periods of weather and soil moisture to protect water quality and to avoid adverse effects.

ALTERNATIVE 3 – NON COMMERCIAL

Direct and Indirect Effects

There would be no sawlog removal under alternative 3. There would be no need for haul roads, temporary roads (existing and new), and road maintenance. Under alternative 3, system roads would be maintained under the scheduled road maintenance program and as funds are available.

ALTERNATIVE 2 AND 3 – ROAD DECOMMISSION

Direct and Indirect Effects

Approximately 11.29 miles of system roads no longer needed for resource management would be decommissioned. Decommissioning would include pulling culverts accompanied with stream channel reconstruction, water-bar/cross drain (spacing based on road grade), ripping and mulching, and blocking entrance. Stream channel reconstruction would recreate and stabilize the natural, pre-road stream channel. Ripping and mulching decommissioned roads would accelerate the roads returning to its natural state. About 2.73 miles of the decommissioned roads would be converted to trails. Estimated average decommission cost is $6,000/mile, conversion to trail is $2,500/mile.

Table 37. Proposed Road Decommissioning

Road #	Road Name	(Miles)	Activity	Road #	Road Name	(Miles)	Activity
24S15A	Baker Point	0.43	Decom	24S45A	Tobias Meadow	0.3	Decom
24S24A	Schultz	0.6	Decom	24S46A	Mc Swiney Blvd	0.46	Decom
24S25A	Tobias Peak Lookout	0.3	Decom	24S80A	Mc Swiney Blvd	0.68	Decom
24S25B	Panorama	0.3	Decom	24S80B	Sunday Peak	0.29	Decom
24S34A	Portuguese Meadow	0.42	Decom	24S80C	Tyler Meadow	0.45	Decom
24S35C	Portuguese Meadow	1.4	Decom	24S83A	Tyler Meadow	0.76	Decom

24S37	Portuguese Meadow	1.1	Decom	24S80	Greenhorn Mountain	1.37	Convert To Trail
24S37A	Sugarloaf	0.6	Decom	24S83	Lower Dry Meadow	1.36	Convert To Trail
24S45	Tobias Meadow	0.47	Decom			**Total Miles**	**11.29**

CUMULATIVE EFFECTS

Past, Present, and Reasonably Foreseeable Effects
Transportation effects analysis area would be the project boundary and haul roads outside of the Tobias Project area. Proposed activities are projected to be completed in 10 years after the Record of Decision. There would be ongoing road maintenance on roads within the project area under schedule of road maintenance program and as funds are available. Temporary roads reopened and those constructed would not be added to the transportation system and would be restored after operations are completed. Approximately 11.29 miles of system roads would no longer be needed for resource management. Road density in the project area would be reduced to improve the watersheds. Maintenance mileage cost would be reduced for the overall FS transportation system. Road maintenance and drainage improvements associated with proposed activities would reduce erosion, sediment from roads, and benefit forest users.

FUELS

ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – NO ACTION

Direct Effects and Indirect Effects

There are no direct effects of choosing the no action alternative. Under the no action alternative, fuels will continue to accumulate across all size classes. The surface fuel loading will continue to build along with increasing ladder and canopy fuels. Fires will burn at a higher severity and be more difficult to suppress.

ALTERNATIVE 2 – PROPOSED ACTION

The proposed action (Alternative 2) and the non-commercial action (Alternative 3), where both alternatives propose to treat 4,897 acres and decommission 11.29 miles of road. Alternative 2 proposes to commercially thin approximately 1,117 acres and to implement non-commercial treatments on approximately 3,782 acres; Alternative 3 proposes solely non-commercial treatments.

Direct and Indirect Effects

The treatment area for the proposed action is the same as alternative 3, except alternative 2 has a commercial component that will remove trees up to 30 inches in diameter on 1,117 acres. This additional tree removal is more effective at lowering the crown fire potential by raising the canopy base height and lowering the canopy bulk density. The surface flame lengths will be reduced to less than four feet which can be attacked successfully by hand crews with hand tools. The reduction of surface and ladder fuels will increase hand crew line production rates by 28 percent. The reduced canopy will also increase the effectiveness of aerial firefighting resources. Mastication without burning would reduce shrub cover.

The temporary road construction and the decommissioning of existing roads will have a negligible effect on fire behavior. The temporary road construction can help with implementation of prescribed burning, but the decommissioning of existing roads in the project area will limit access for future fire suppression.

Cumulative Effects

From a fuels standpoint, the 1990 Stormy Fire reset the fire return interval by burning ninety percent of the project area and type converting 3,300 acres of timber to a brush fuel type. Post Stormy fire projects are salvage logging, brush removal and tree planting.

Summary of Effects

Both Alternative 2 and Alternative 3 are effective at altering the fuels conditions. Mastication, which is common to both the action alternatives, can significantly reduce shrub cover more than mastication followed by prescribed fire (Collins, et al., 2007).

Botanical Resources

Environmental Consequences

Alternative 1, No Action

Direct and Indirect

Under this alternative there will be no direct, indirect, or cumulative effects to known populations of Shirley Meadow Star-Tulip (*Calochortus westonii*), and undiscovered individuals of Muir's Raillardella (*Carlquista muirii*); Unexpected Larkspur (*Delphinium inopinum*); and Greenhorn Fritilary (*Fritillaria brandegeei*).

Alternative 2, Proposed Action - Commercial Treatment

Direct and Indirect

No known populations of Shirley Meadow star-tulip, (*Calochortus westonii*); Muir's Raillardella, (*Carlquista muirii*); Unexpected Larkspur, (*Delphinium inopinum*); or Greenhorn Fritilary, (*Fritillaria brandegeei*) are found within the units proposed for tractor/skyline logging and none were discovered in botany surveys for the project. As such there will be no direct or indirect effects on these species from the commercial logging.

Shirley Meadow Star-Tulip is a bulb that grows, flowers, set seed, and dies back to the ground by June 31st in most years. Because populations of Shirley Meadow Star-Tulip (*Calochortus westonii*) are known and were found within mastication units, the mastication activity will be confined to a limited operating period between July 15th and the suspension/cessation of mechanical equipment operation in the fall, based on soil moisture conditions (BMP 5.6). This will limit the direct effect on populations of Shirley Meadow star-tulip to light to moderate soil disturbance at a time of year when the plants/bulbs are underground. The indirect effects of this soil disturbance would be to increase surface soil erosion by a moderate amount (with natural levels) because of the soil disturbance and the removal of some of the organic cover.

No populations of Muir's Raillardella, (*Carlquista muirii*); Unexpected Larkspur, (*Delphinium inopinum*); or Greenhorn Fritilary, (*Fritillaria brandegeei*) are found within the units proposed for mastication and none were discovered in botany surveys for the project. Mastication may have direct effects of undiscovered individuals of these species but would not lead to a loss of viability.

In Alternative 2, indirect short-term increases in risks from the introduction and spread of noxious weeds from equipment used during implementation of the project as well as reductions of soil cover can be expected. Reductions of soil cover increases the risk of introduction that weeds can become established. Noxious weed infestations are a threat to sensitive plants and their habitats. Mitigations to prevent the introduction and spread of noxious weeds into the proposed treatment areas have been built into the project. These mitigations include:

- Require equipment washing prior to arrival at project area under timber sale contract provision
- Avoid any known infestations during project implementation.
- Use weed-free erosion control materials.
- Any noxious weed occurrences found during project layout and implementation should be reported to the Forest botanist.

These practices would fully mitigate the risk of negative indirect effects from noxious weeds on sensitive plants.

ALTERNATIVE 3, NON - COMMERCIAL TREATMENT

Direct and Indirect

Alternative 3 does not include any commercial tractor or skyline logging. Therefore the only potential for light to moderate soil disturbance comes from the mechanical mastication.

Shirley Meadow star-ulip is a bulb that grows, flowers, set seed, and dies back to the ground by June 31st in most years. Because populations of Shirley Meadow star-tulip (*Calochortus westonii*) are known and were found within mastication units, the mastication activity will be confined to a limited operating period between July 15th and the suspension/cessation of mechanical equipment operation in the fall, based on soil mosture conditions (BMP 5.6). This will limit the direct effect on populations of Shirley Meadow star-tulip to light to moderate soil disturbance at a time of year when the plants/bulbs are underground. The indirect effects of this soil disturbance would be to increase surface soil erosion by a moderate amount (with natural levels) because of the soil disturbance and the removal of some of the organic cover.

No populations of Muir's Raillardella, (*Carlquista muirii*); Unexpected Larkspur, (*Delphinium inopinum*); or Greenhorn Fritilary, (*Fritillaria brandegeei*) are found within the units proposed for mastication and none were discovered in botany surveys for the project. Mastication may have direct effects of undiscovered individuals of these species but would not lead to a loss of viability.

In Alternative 3, the non-commercial alternative, indirect short-term increases in risks from the introduction and spread of noxious weeds from equipment used during implementation of the project as well as reductions of soil cover can be expected. Reductions of soil cover increases the risk of introduction that weeds can become established. Noxious weed infestations are a threat to sensitive plants and their habitats. Mitigations to prevent the introduction and spread of noxious weeds into the proposed treatment areas have been built into the project. These mitigations include:

- Require equipment washing prior to arrival at project area
- Avoid any known infestations during project implementation.
- Use weed-free erosion control materials.
- Any noxious weed occurrences found during implementation should be reported to the Forest botanist.

These practices would fully mitigate the risk of negative indirect effects from noxious weeds on sensitive plants.

Cumulative Effects

A critical step in cumulative effects analysis is to compare the current condition and the projected changes due to management activities. This can be difficult because of the background natural variability in the resources and processes of concern. Plant and population ecology is not known for most sensitive plants on the Sequoia NF. Additionally, many sensitive plant habitats on the forest have a long history of disturbance and an undisturbed reference habitat is often lacking. Minimizing on-site changes to sensitive plants can be the most effective way of reducing cumulative impacts. If adverse effects have not been minimized at the local level, cumulative effects could occur.

Management activities that have cumulatively impacted sensitive plant occurrences within the analysis area include logging, salvage logging, road construction, grazing, wildfire, fire suppression, silvicultural planting/release, mining, and recreation use. These cumulative impacts have altered the present landscape to various degrees. Cumulative impacts vary from species to species.

Past and current activities on NFS lands have altered potential habitats for the following sensitive plant species: Shirley Meadow star-tulip, (*Calochortus westonii*); Muir's raillardella, (*Carlquista muirii*); unexpected larkspur, (*Delphinium inopinum*); and Greenhorn fritilary, (*Fritillaria brandegeei*). Effects have resulted from forest road development, timber harvest, mining, recreation activities, invasive exotic noxious weed invasions, and changes to hydrology. Limited operating periods are used as a management strategy to reduce cumulative impacts to known occurrences, for both plants and animals. For this project, a limited operating period will be effective in reducing cumulative impacts and is the recommended method for the occurrences of sensitive plants, and their habitats associated with this project

Determination

Alternative 1, No Action

It is my determination that the direct, indirect and cumulative impacts of the no action alternative are **not likely to cause or contribute to a trend leading to protection under the Endangered Species Act or loss of viability** for the following Forest Service Sensitive Plants: Shirley Meadow Star-Tulip, (*Calochortus westonii*); Muir's Raillardella, (*Carlquista muirii*); Unexpected Larkspur, (*Delphinium inopinum*); and Greenhorn Fritilary, (*Fritillaria brandegeei*).

Alternative 2, Proposed Action – Commercial Treatment

It is my determination that the direct, indirect and cumulative impacts of the proposed action **are not likely to cause or contribute to a trend leading to protection under the Endangered Species Act or loss of viability** for the following Forest Service Sensitive Plants: Shirley Meadow Star-Tulip, (*Calochortus westonii*); Muir's Raillardella, (*Carlquista muirii*); Unexpected Larkspur, (*Delphinium inopinum*); and Greenhorn Fritilary, (*Fritillaria brandegeei*). No plant species listed for protection, proposed or candidate for listing for protection under the federal Endangered Species Act of 1973 as amended would be affected by this project.

Appropriate mitigations have been incorporated into the project design to avoid or mitigate potential adverse effects.

Alternative 3, Non-Commercial Treatment

It is my determination that the direct, indirect and cumulative impacts of the non-commercial alternative **are not likely to cause or contribute to a trend leading to protection under the Endangered Species Act or loss of viability** for the following Forest Service Sensitive Plants: Shirley Meadow star-tulip, (*Calochortus westonii*); Muir's raillardella, (*Carlquista muirii*); Unexpected larkspur, (*Delphinium inopinum*); and Greenhorn fritilary, (*Fritillaria brandegeei*). No plant species listed for protection, proposed or candidate for listing for protection under the federal Endangered Species Act of 1973 as amended would be affected by this project.

Appropriate mitigations have been incorporated into the project design to avoid or mitigate potential adverse effects.

CULTURAL RESOURCES

ENVIRONMENTAL CONSEQUENCES

INDIRECT EFFECTS OF VEGETATION MANAGEMENT ON CULTURAL RESOURCES

In general, any type of vegetation removal, from either hand treatment or fire, reduces protective vegetative cover and increases the visibility of cultural resources, which can result in unlawful collecting and excavation. The lack of vegetation can also contribute to an increase in erosion that can damage or destroy the site matrix. Fire on any level can result in the loss of ethnographic resources and the disturbance and degradation of traditional plant gathering areas, cultural sites, and sacred or spiritual places.

The use of heavy equipment within a site boundary can lead to increased erosion. This is caused by soil disaggregation, creation of ruts that channel water, and loss of vegetation cover. Erosion over a site can wash away archaeological soils and artifacts, and cause artifacts to be more visible. Enhanced visibility increases the chance a site will be looted. (Means et al. 2011)

DIRECT AND INDIRECT EFFECTS OF FIRE AND FUELS ON CULTURAL RESOURCES

Fire and fuels management in all alternatives focuses on creating defensible space and fuels reduction.

Any fire can potentially affect cultural resources. The effects of fire on cultural resources are often divided into and described as direct fire, operational, and post-fire effects. Direct effects are those caused by the fire itself. These are caused by either direct contact with flames or being in close proximity to heat produced by combustion or smoke. Operational effects are the result of management operations like line construction or staging. Post-fire effects are most often those caused by the change in soil stability and vegetation following a fire.

The differences in effects on cultural resources from fire come with the differences in the intensity of a fire, the ability to identify cultural resources and initiate protective measures, the type of management actions taken to control the fire, and the post-fire effects.

The potential effect on cultural resources from direct fire depends on the material components of the cultural resource and the magnitude of the heating and combustion generated by a fire. Specifically, fire and its byproducts can alter such resources through total consumption, melting, breakage, spalling, charring, and discoloration. Different materials are vulnerable based on the peak and duration of the exposure to heat and combustion. For example, a wooden structure may easily ignite and be fully consumed, whereas a bedrock milling feature in the same fuel model is relatively impervious to fire. Further, some raw materials may have multiple importance attribute classes that are affected at different temperatures and/or durations. For example, in the case of obsidian artifacts, hydration rinds can be compromised at relatively low temperatures (<200–300°C), whereas severe morphological damage such as breakage or melting generally does not occur until higher temperatures (>700°C) are reached (Deal 2001).

Perishable artifacts (those that have carbon in their makeup) have virtually no tolerance for fire and would be destroyed by it. Non-perishable artifacts (depending on the artifact type) will tolerate only low- or moderate-intensity fire. Cultural landscapes can tolerate fire intensity that will not cause the introduction of non-compatible elements (such as bulldozed fire lines) or a change in vegetation community (chaparral to grasslands).

The magnitude and duration of the heat pulse depends on fuel loading, fuel moisture content, fuel distribution, rate of combustion, soil moisture content and other factors. The movement of heat into the cultural material is not only dependent upon the peak temperature reached, but even more so upon the length of time that the heat source is present and the composition of the cultural resource. Because fuels are not evenly distributed on or around a cultural resource, and due to the variability of materials types that make up a cultural resource site, a mosaic of heating and corresponding effects usually occurs. The highest heat pulses are usually associated with areas of greatest fuel consumption and the areas that burn the longest.

Artifacts surrounded or in contact with fuels such as wood and duff are most susceptible to direct contact with flames and heat. These artifacts are affected by convection, radiation, and conduction heat transfer. Artifacts and features above the ground surface (i.e., structures, arboglyphs, rock art, etc.) are susceptible to preheating, convection heat transfer, and smoke impacts. Thus, surface and shallow cultural resources consisting of flammable organic components (i.e., wooden structures, botanical remains) are at greatest risk from direct flame impingement, especially high intensity fire.

High-intensity fire in general has a greater potential to negatively affect cultural resources than low-intensity fire. Fires with cool combustion temperatures, generated by sparse understories and light fuels, have a lower potential to affect diagnostic artifact characteristics. Fires designed for cool combustion temperatures, such as controlled burns, can avoid major impacts on archaeological sites and artifacts. Thus, prescribed burns can be effectively used to control vegetation on archaeological sites without damage to cultural resources (U.S. Army Corps of Engineers 1989a).

Operational effects are usually from ground-disturbing activities, but can also be from backfires and burnouts, and the use of fire retardants. They are not limited to wildfires, but can also occur during prescribed burns. These effects are not always in the immediate vicinity of a fire, but can occur miles away as a result of the construction of camps, fire lines, etc. Operational effects can be mitigated, if planned in advance, to avoid and protect cultural resources.

Wildfire ignitions are unplanned and thus limit the ability for prior cultural resources identification and the development and implementation of protective measures for cultural resources. These increase the potential for negative effects on cultural resources. Extreme fire behavior associated with uncontrollable wildfire has a higher potential to affect cultural resources. Suppression actions taken for uncontrolled wildfire typically have limited cultural resource management input and have a greater potential to negatively affect cultural resources than pre-planned projects. Managed wildfires, while often having lower fire intensity than uncontrolled wildfire, usually have limited cultural resource management input and also have more potential to negatively affect cultural resources than prescribed fire.

Activities associated with wildfire suppression that cause ground disturbance (such as fire lines, helicopter bases and heliports, base/spike camps, and drop points) can affect cultural resources. Foam or water applied to hot rock surfaces causes spalling, "potliding," or fracturing that can damage archaeological features. Water and retardant drops can damage or destroy historical structures or hasten their deterioration.

Fuelbreaks and other ground disturbances associated with fire protection often provide access into areas that were previously inaccessible, resulting in an increased potential for site damage and vandalism. Erosion runoff from these sites can affect cultural resource sites located within or adjacent to these features.

Low-intensity fire and planned vegetation reduction has a beneficial effect of protecting cultural resources from catastrophic, high-intensity fire and large-scale post-fire erosion.

Post-fire effects include increased erosion of soils that can remove or bury archaeological resources, increased tree mortality resulting in impacts from trees falling or uprooting, increased rodent and insect populations that can alter subsurface soil structure, intentional and inadvertent looting, increased microbial activity which can lead to increased feeding on organic matter within archaeological soils, and the addition of “new” carbon, which can be move through the soil column of archaeological sites by a variety of agents. These potential effects can be mitigated during prescribed burns through the use of fire prescriptions that limit the intensity of the fire.

In the case of fuels reduction, either by hand treatments or prescribed fire, the project planning process allows time to identify cultural resources and to develop and implement protective measures. This planning leads to greater protection of cultural resources and longer-term protection of cultural resources because of reduced fuel loads. The potential for operational effects is greatly reduced because control lines and staging can be placed to avoid cultural resources. The potential for direct fire and post-fire effects are also reduced because site-specific projects are planned to avoid extreme fire intensity, which has the greatest potential to negatively affect cultural resources.

WILDFIRE EFFECTS ON CULTURAL RESOURCES

Due to the present situation with vegetation, including high surface fuel loads, overstocked stands, and longer fire seasons, the project area retains an increased potential for wildfires.

Mitigation measures for cultural resource site protection include a program of pre-fire surveys of high-susceptibility areas, potential fire control lines, and other fire suppression-related activity locations. Where cultural resources are found, programmatic agreement standard protection measures would be used, such as project redesign, relocation, protective buffer areas, and monitoring to protect affected cultural resources. Inventories should also occur during fire suppression activities in areas not inventoried. Effective treatment measures should be used to rehabilitate fire suppression-related ground disturbance.

CUMULATIVE EFFECTS FOR CULTURAL RESOURCES

Alternative 1

The lack of active management and fuels reduction decreases the potential for surface impacts to cultural resources from management actions. Continued accumulation of surface and ladder fuel in Alternative 1 makes this alternative have higher potential for unplanned wildfire impacting cultural resources than either of the action alternatives 2 and 3.

Alternative 2

Under Alternative 2, effects from vegetation management actions include hand thinning, mastication, pile burning, understory burning, as well as commercial treatment. Commercial treatment includes impacts from removing trees with heavy equipment, skyline yarding, dragging/skidding trees, and the construction and decommission of roads and landings.

Alternative 2 identifies 5,986 acres of vegetation treatments that reduces the amount of fuel loading on 53 out of 60 sites (88 percent) within the project area. Seven sites are in areas that will not receive treatment. The reduction of fuels on sites in this alternative has a greater beneficial effect on cultural resources than Alternative 1 because less fuels leads to less potential for catastrophic fire and unplanned emergency actions to damage sites. However, 13 out of the 53 sites that are within treatment areas (21 percent of total sites) are located within commercial treatment which, without mitigation, can have a higher degree of impacts than Alternative 1.

Alternative 3

The risk of impacts from commercial treatments is eliminated in Alternative 3 leaving impacts from all other vegetation management actions including hand thinning, mastication, pile burning, and understory burning.

Actions under Alternative 3 potentially affect the same 53 out of 61 (88 percent) sites as Alternative 2. This alternative has a greater overall beneficial effect than Alternative 1 because of the reduction in fuels. Due to the lack of commercial treatment this Alternative has less overall effects than Alternative 2.

TRIBAL AND NATIVE INTERESTS

ENVIRONMENTAL CONSEQUENCES

EFFECTS OF VEGETATION MANAGEMENT ON TRIBAL AND NATIVE AMERICAN INTERESTS

Healthy and diverse vegetation potentially provides a wide range of plants that Native Americans use for a variety of cultural reasons. Although invasive species pose a threat to a healthy vegetation community, certain management activities pose environmental consequences that may be considered negative by the Native American community.

The Native American community acknowledges and agree that protection and restoration of the forest is needed and appropriate. In addition, they acknowledge and urge the Sequoia National Forest to conduct vegetation management and fuels management. They further urge the forest to reduce the excessive numbers of shade-tolerant species to provide favorable conditions for native plant establishment, protect the giant sequoia groves, and allow adequate openings for native plants used in basketry and for food to establishment, and growth.

The Tule River Tribe has expressed concerns that vegetation management on the forest should address the potential spread of forest insect and disease activity to tribal forestlands, fuels management, and proactive management based on scientific research and proven management practices with integration of Traditional Cultural Knowledge.

Effects of Fire and Fuels on Tribal and Native American Interests

Wildland fire can disturb and degrade traditional plant gathering areas, archaeological sites, impact valuable watersheds, and sacred/spiritual places, as well as cause the loss of ethnographic resources. If not properly managed, prescribed fire can have the same results. However, with proper management, prescribed fire can be used to help promote the propagation of selected species of plants (basketry plants) important to Native Americans.

Fire of any nature may alter landscapes important to traditional cultural beliefs or practices. An indirect effect of wildland fire is an increase in access created by the removal of vegetation. This access could bring an increase in use to areas essential to Native Americans as places for solitude or privacy.

Wildland fire suppression and fire protection programs (community defense zones) have the potential to introduce foreign visuals (firelines, etc.) into a traditional landscape that may be integral to traditional or contemporary ceremonies and practices.

Prescribed burning may directly damage or destroy cultural resources and other values held to be of significance by contemporary cultures, and it may alter landscapes important to traditional cultural beliefs or practices.

Mitigation measures suggested by the Native American community include focusing on land management activities to hinder the spread and establishment of invasive species. To be effective, eradication should include the correction of the chronic human-related land disturbance activity responsible for the conditions that facilitate the establishment of invasive species, and it should restore the native vegetation and natural disturbance regime (including fire). The use of alternative methods of plant control such as hand weeding or hand-removal (though potentially costlier) would reduce concerns about the use of herbicides as a vegetation management tool. If herbicides are chosen as a treatment option then, during the site-specific analysis, consultation with tribes and Native Americans would help identify areas of concern to avoid, identify alternative methods of eradication to minimize effects on these areas, and focus herbicide use in areas of lower sensitivity for the tribal and Native American community.

Effects of Road Decommissioning on Tribal and Native American Interests

The roads proposed for decommissioning under the Tobias project have not been identified as holding any issues or concerns. The decommissioning has not been identified as impacting access to any traditional gathering areas, and/or tribal special interest areas. At the Tribal meeting held on February 2, 2016, the project IDT leader and staff shared maps that had the road decommissioning analysis. The tribal representatives also had areas explained to them as to the location of the potential roadside loading areas. They took this helpful information for further consultation and communications with tribal leadership and staff members. Increasing the tribe's familiarity with the project area will lead to more questions or opportunities regarding access to various archeological sites, gathering areas and possible sacred sites.

Effects to Tribal and Native American Interests

All Alternatives

The current lack of information is the limiting factor in the assessment of environmental consequences of activities on those items of concern to local tribes, Native American groups, and individuals. The desired information centers on the type of resources used (plants, stone, etc.), resource locations, and the relationship of the natural environment to native people. Fundamental baseline inventory data are limited and usually available on a project-specific basis rather than a landscape level. This is further accentuated by the hesitancy of the Native American population to share information with the national forests out of concern that the information will not remain confidential and the resources of concern will be damaged or destroyed.

Native Americans view their space within the forest as a participant, not as a manipulator or manager, which is the view of non-indigenous cultures. Any alteration, such as ground disturbance, that is permanent and not in harmony with the environment could be a negative effect in the Native American view.

They are also concerned with impacts on cultural resources that are associated with their ancestors and other indigenous people who lived in the Forest area. The discussion of environmental effects in the Cultural Resources section of this report that is applicable to Native American cultural resources applies here and will not be repeated. Growing emphasis on Native American input to the management of national forests has the possibility of broadening the understanding and awareness of historical ecosystem management. By incorporation of indigenous knowledge we can identify the specific gathering areas where manzanita and elderberry are located so these can be flagged and avoided. It may also lead to opportunities for making it a better growing place with easy access for gatherers. Tribal representatives spoke about the gathering locations, the Native American sacred site locations; how they, the Indian families and tribes are protective of these areas/locations; they are secret. They shared examples of areas being over harvested or over gathered; they cited an example of sedge beds (basket weaving material) being impacted by those who didn’t understand nor practice cultural horticultural techniques. Tribal representatives asked about the project botany report and if we can make this list available; there are different types of clover near springs and water sources and due to its elevation there may be other types of plants of interest to the tribes; the tribe may have historical information to share that would help us to protect and restore these valuable resources. It was shared that there will be removal of oak trees within the project area. These oaks or oak grove areas should be shared/discussed with tribal gatherers as a way to avoid removal of a potential valuable acorn gathering area. Site trips with the tribal representatives are still a valid mitigation measure to consider.

By working with the tribal gatherers we can also gain a better perspective on the harvest window of opportunity. Using their knowledge to better understand when a particular plant/food/medicinal resource is ready for harvesting will lead to smoother communications with project Contract Officer’s representative and others involved with the project actions and activities.

Discussions of the potential effects to archaeological resources are included in the Cultural Resources section of this report. Any management direction that could result in alteration of or the introduction of non-natural elements into the natural environment could be an issue of concern to tribes, Native American groups and individuals. Any direction that could promote, improve, preserve, or restore the natural environment and natural features, or promote the fabric of harmonious environment interactions, would probably not be viewed as an issue of concern. Any management direction that promotes the ability to access the natural open space of the national forests would be more acceptable to tribes, Native American groups and individuals than direction that restricts access.

All alternatives would continue tribal relations protocols established by laws and regulation and the Forest Plan. Government-to-government consultation and consultation with non-federally recognized tribal groups and individual Native Americans would continue to follow existing laws and regulations.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE ON TRIBAL AND NATIVE AMERICAN INTERESTS

Alternative 1

The lack of active management and fuels reduction would allow fuel loads to increase over time and leave tribal lands and important resources vulnerable to unplanned wildfires. Alternative 1 has a higher potential for unplanned wildfire impacting Tribal and Native American Interests than either of the action alternatives.

Alternative 2

Alternative 2 identifies the greatest number of understory burn, mastication and hand thinning. This decrease in surface and ladder fuel in Alternative 2 would have a greater beneficial effect on Tribal and Native American Interests than Alternative 1, because it reduces the potential for unplanned wildfires to move from the forest to the reservation. The potential beneficial effects from mastication and understory burning on Tribal and Native American Interests under Alternative 2 would be greater than under Alternative 1.

The commercial aspects of Alternative 2 of tractor based harvesting, road construction, and skyline yarding would result in greater amounts of ground disturbing due to the need for skid trails, landings, hot decks, and associated impacts which could result in the disturbance of culturally important tribal areas. The impacts for Alternative 2 are potentially greater than in Alternatives 1 and 3.

The commercial thinning in this alternative would restore stand structure which would benefit restoration of tribally important plants and materials.

Alternative 3

Alternative 2 and 3 have equal impacts from understory burning.

While Alternative 3 has no commercial treatments, it does increase the acres of mastication and hand thinning. So the total acres impacted are equal in Alternatives 2 and 3. The difference in impacts between commercial treatments versus mastication and hand thinning has not been identified as having different impacts to tribal interests.

Both Alternatives 2 and 3 have a reduction in fire intensity and potential for crown fire and greatly increase the potential of containing a fire on Forest Service lands. Thus Alternatives 2 and 3 have equal potentially beneficial effects on Tribal and Native American interests in the Tobias area.

CUMULATIVE EFFECTS FOR TRIBAL AND NATIVE AMERICAN INTERESTS

Alternative 1 would not move forward with the management objective of reducing fuels and decreasing the potential for unplanned wildfire spread into the area of tribal interest. Overtime the increasing fuel loads and potential fire intensity would reduce the effectiveness of fuels reduction projects between the Tobias area and the Tule River Reservation. Incorporation of indigenous knowledge can help prioritize the work to identify how to manage fires for resource benefit. Thus Alternative 1 would have a greatest potential negative cumulative effect.

Alternative 2 would begin management objectives to reduce fuels and reducing the potential for unplanned wildfire spread into the areas of tribal interest. The reduced fuel loads and potential fire intensity would increase the effectiveness of fuels reduction projects completed and planned between the Tobias area and the Tule River Reservation. Incorporation of indigenous knowledge can help prioritize the work to identify how to manage fires for resource benefit. Thus Alternative 2 would have a potential beneficial cumulative effect to Tribal and Native American Interests.

Alternative 3 decreased fuel loads and potential fire intensity would increase the effectiveness of fuels reduction projects completed and planned between the Tobias area and the Tule River Reservation. Incorporation of indigenous knowledge can help prioritize the work to identify how to manage fires for resource benefit. Thus Alternative 3 would have a potential beneficial cumulative effect to Tribal and Native American Interests.

FIRE AND FUELS

ENVIRONMENTAL CONSEQUENCES

The Fire and Fuels Extension (FFE) to the Forest Vegetation Simulator (FVS) was used for the fuel and fire behavior analysis. The fuel models are based on the different California Wildlife Habitat Relationships (CWHR) system (Mayer and Laudenslayer 1988) shown in Table 38. The Table classifies stands by their canopy cover and the size of the larger trees in the stand, predicting CWHR size class and CWHR density class (third and fourth columns).

Table 38. California Habitat Relationships, as defined by Mayer and Laudenslayer (1998)

Tree size (DBH in.)*	Canopy cover (%)	CWHR Size Class	CWHR Density Class	Stand Description
< 1	< 10	1	–	Seedlings
1 - 6	10 – 24	2	S	Sapling – sparse
1 - 6	25 – 39	2	P	Sapling – open cover
1 - 6	40 – 59	2	M	Sapling – moderate cover
1 - 6	> 60	2	D	Sapling – dense cover
6 – 11	10 – 24	3	S	Pole tree – sparse
6 – 11	25 – 39	3	P	Pole tree – open cover
6 – 11	40 – 59	3	M	Pole tree – moderate cover
6 – 11	> 60	3	D	Pole tree – dense cover
11 – 24	10 – 24	4	S	Small tree – sparse
11 – 24	25 – 39	4	P	Small tree – open cover
11 – 24	40 – 59	4	M	Small tree – moderate cover
11 – 24	> 60	4	D	Small tree – dense cover
> 24	10 – 24	5	S	Med/Lg tree – sparse
> 24	25 – 39	5	P	Med/Lg tree – open cover
> 24	40 – 59	5	M	Med/Lg tree – moderate cover
> 24	> 60	5	D	Med/Lg tree – dense cover
> 24	> 60	6	–	Multi-layer canopy, dense cover

*QMD of the 75 percent largest trees based on basal area.

The FVS-FFE modeling program is able to dynamically blend the standard fuel models (FM) based on changing fuel loads and stand characteristics over time (FFE Guide pg. 35). The fire behavior outputs are a weighted average using one or more fuel models. The FFE program creates a custom fuel model for each situation. In some situations, a thinning or disturbance may cause one or the selected fuel models to switch from FM8 or FM9 to FM5 or FM26. Fuel models 25 and 26 are custom fire models developed in California (FFE Guide pg.366). Model 25 is used to describe fire behavior in plantations greater than 25 years old with shrub understory and low crown mass. Model 26 is used on sites similar to those where Model 4 would be used but with lower fuel bed depth and loading.

Table 39. Fire behavior fuel models for the Western Sierras WS-FFE are determined using forest type and CWHR class.

Size Class	1	2				3				4				5				6
Density Class		S	P	M	D	S	P	M	D	S	P	M	D	S	P	M	D	
Forest Type																		
Pine – east side	9	2	2	9	9	2	2	2	9	2	2	8	8	2	2	8	8	10
Pine – west side	9	5	5	9	9	26	26	25	9	26	26	8	8	26	26	8	8	10
Red fir	8	8	8	8	8	11	11	8	8	8	8	8	8	8	8	8	8	10
White fir – east side	8	8	8	8	8	11	11	11	8	8	8	8	8	8	8	8	8	10
White fir – west side	8	5	5	8	8	11	11	8	8	8	8	8	8	8	8	8	8	10
Douglas-fir	8	5	5	8	8	5	5	8	8	11	11	9	8	11	11	9	8	10
Giant sequoia	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	10
Jeffrey pine	9	9	9	9	9	2	2	2	9	2	2	2	9	2	2	2	9	10
Hardwoods	8	5	5	9	9	11	11	11	9	9	9	9	9	9	9	9	9	10
Lodgepole pine	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	10
Pine mixed – conifer	9	5	5	9	9	26	26	25	9	26	26	8	8	26	26	8	8	10
Fir mixed – conifer	8	9	9	8	8	26	26	11	8	5	5	8	8	5	5	8	8	10
Other softwood	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	10

For the purpose of this analysis, twenty-one CWHR type were used to model fire behavior which accounts for 83 percent of the treatment area. The FFE outputs analyzed are canopy base height (CBH), canopy bulk density (CBD), torching index, crowning index, type of fire, surface flame length, total flame length and smoke emission. The weighted averages for these outputs do not include stands comprised of shrub or plantations mixed with shrubs. The shrub fuel model has a CBH of 2 feet and covers 58 percent of the treatment area. Using this shrub fuel model in the weighted averages of this analysis would skew the data by showing a higher occurrence of a crown fire and greater flame lengths. Therefore, the shrub fuel model was analyzed separately.

Table 40. Shows the number of acres and fuel models used for FVS-FFE calculations.

CWHR Type	Acres	Alt 1	Alt 2	Alt 3
**SHRUB	2623	26	100% 9	100% 9
JPN3D	10	69% 8, 31% 10	100% 2	100% 2
JPN3M	95	82% 2, 18% 10	100% 2	100% 2
JPN3P	73	98% 2, 2% 10	100% 2	100% 2
JPN4D	6	61% 9, 39% 10	100% 2	100% 9
JPN5M	6	75% 8, 25% 10	100% 8	100% 8
SMC3D	4	87% 8, 13%11	100% 5	100% 8
SMC3M	31	89% 8, 11% 11	100% 5	100% 5

SMC3S	6	67% 8, 33% 9	100% 5	100% 5
SMC4D	306	100% 10	77% 11, 23% 8	100% 8
SMC4M	344	67% 8, 33% 10	60% 8, 40% 5	100% 8
SMC4P	37	66% 5, 33% 8, 2% 10	100% 5	71% 5, 29% 8
SMC4S	18	100% 5	100% 5	100% 5
SMC5M	54	72% 8, 28% 10	73% 8, 28% 5	100% 8
WFR4D	220	100% 10	95% 8, 5% 10	100% 10
WFR4M	64	100% 10	100% 8	100% 10
WFR4P	3	80% 8, 20% 10	100% 8	100% 8
WFR5D	312	70% 10, 30% 8	100% 8	100% 8
WFR5M	268	56% 8, 44% 10	100% 8	100% 8
WFR5P	15	75% 8, 25% 10	100% 8	100% 8
WFR5S	13	97% 8, 3% 10	100% 8	100% 8

***JPN = Jeffery pine, SMC = Sierra mixed conifer, WFR = White fir. **The shrub fuel model was analyzed separately and is not included in the weighted average for the outputs.**

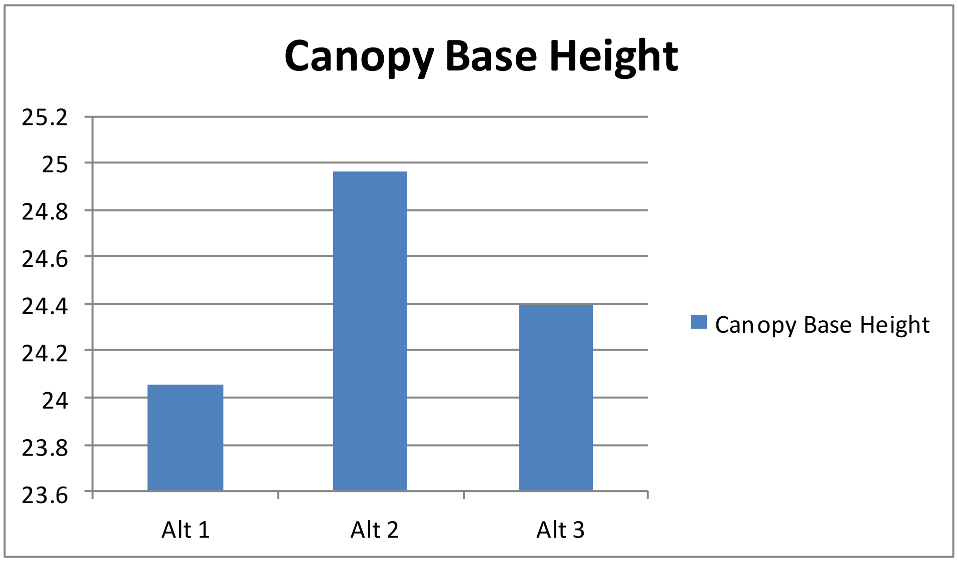
CROWN FIRE

Crown fires are typically faster moving than surface fires, more difficult to suppress, and result in more tree mortality and smoke production. FFE-FVS uses information about surface fuel and stand structure to predict whether a fire is likely to crown. The Fire and Fuels Extension to the Forest Vegetation uses the Sando and Wick approach in combination with Brown's (1978) equations to estimate canopy base height and canopy bulk density(Scott and Reinhardt 2001).

Canopy Base Height

Canopy base height (CBH) is defined as the lowest height above which at least 30 lbs./acre/foot of available canopy fuels are present. Canopy base height is the lowest height above the ground where there is a sufficient amount of canopy fuel to transition a fire from the surface fuels into the tree crowns. (Scott and Reinhardt 2001). Therefore, canopy base heights are a critical factor in determining crown fire potential. Stands with an increased CBH will require longer flame lengths to initiate torching. Fuels treatments should focus on removing some or all of the ladder fuels and other vegetation that contributes to a low canopy base height, especially where reducing crown fire initiation is a priority. The structure and species composition of the stands, as well as dense understory trees are contributing to the low canopy base heights observed. Drier sites in the project area tend to have greater variation in stand structure due to small openings in the canopy, but canopy base heights are still low due to the tall shrubs and understory trees. Raising the canopy base height lowers the potential for a surface fire to propagate to the crowns of the overstory trees.

Figure 28. Weighted average of canopy base heights in timber fuel types per alternative.



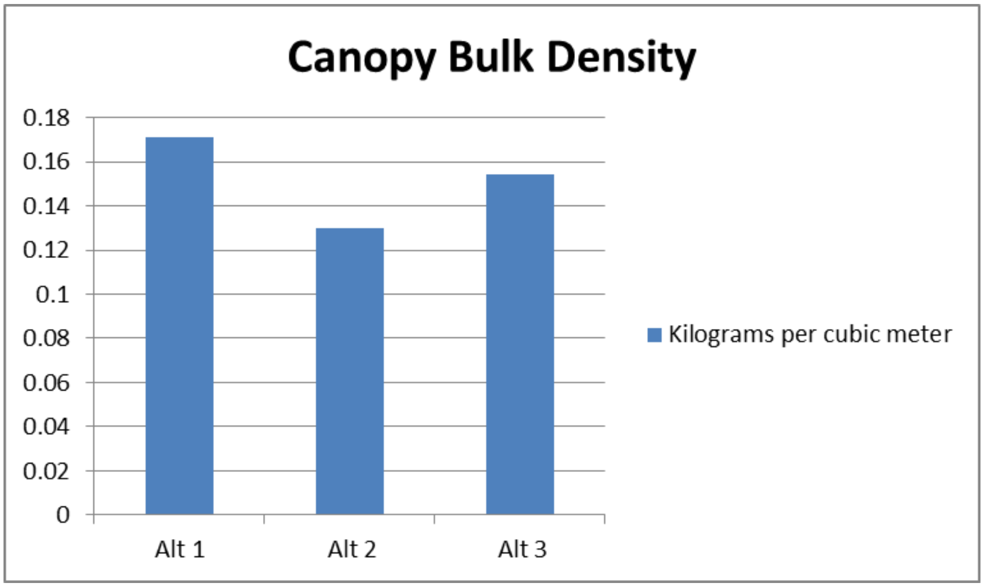
Canopy Bulk Density

Crown fire potential is generally based on the amount of surface fuels, the amount of ladder fuels, and the density and spacing of the canopy. Heavy surface fuel loadings generally contribute to longer flame lengths. Low canopy base heights (CBH) can carry surface fires into the crowns. Once established, the crown fire may persist. The more spaced the canopy, the greater the wind necessary to move fire from one crown to the next. Dense canopies, or canopies with a high canopy bulk density (CBD), would require a lower wind speed to support crown fire.

Canopy bulk density (CBD) is the mass of available fuel per unit of canopy volume (kg/m^3). It is a bulk property of a stand, not an individual tree. CBD is an important crown characteristic needed to predict crown fire spread.

Dense stands can have a CBD of 0.3 kg/m^3or greater. CBD affects the critical spread rate needed to sustain active crown fire. Therefore, the lower the canopy bulk density, the lower the potential for active crown fire. CBD of anything greater than .1kg/m^3 is considered to be capable of sustaining crown fire. Figure 30 compares the change in CBD by alternative. Both the action alternatives show a reduction in CBD with alternative 3 having less of a reduction.

Figure 29. Weighted average of canopy bulk density in timber fuel types per alternative.

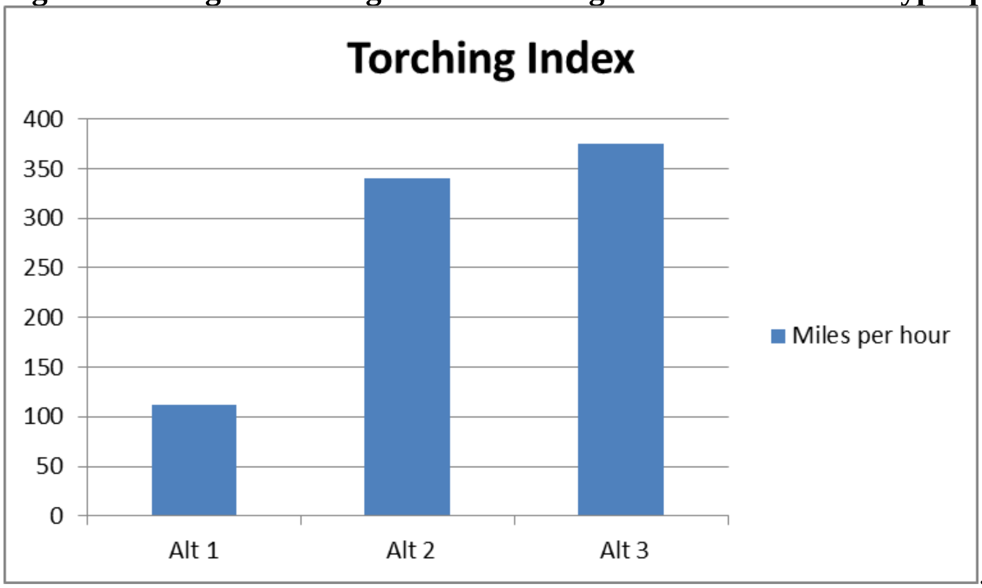


Crown fire indices

Two crown fire hazard indices are calculated in the FFE-FVS modeling: torching index and crowning index. Torching index is the 20-foot wind speed at which a surface fire is expected to ignite the crown layer, while crowning index is the 20-foot wind speed needed to support an active or running crown fire. Torching index depends on surface fuels, surface fuel moisture, canopy base height, slope steepness and wind reduction by the canopy. As surface fire intensity increases (with increasing fuel loads, drier fuels, or steeper slopes), or canopy base height decreases, it takes less wind to cause a surface fire to become a crown fire. Crowning index depends on canopy bulk density, slope steepness, and surface fuel moisture content. As a stand becomes denser, active crowning occurs at lower wind speeds, and the stand is more vulnerable to crown fire. For both indices, lower index numbers indicate that a crown fire can be expected to occur at lower wind speeds, so crown fire hazard is greater at lower index values. The complete algorithms for determining torching and crowning index are described in Scott and Reinhardt (2001).

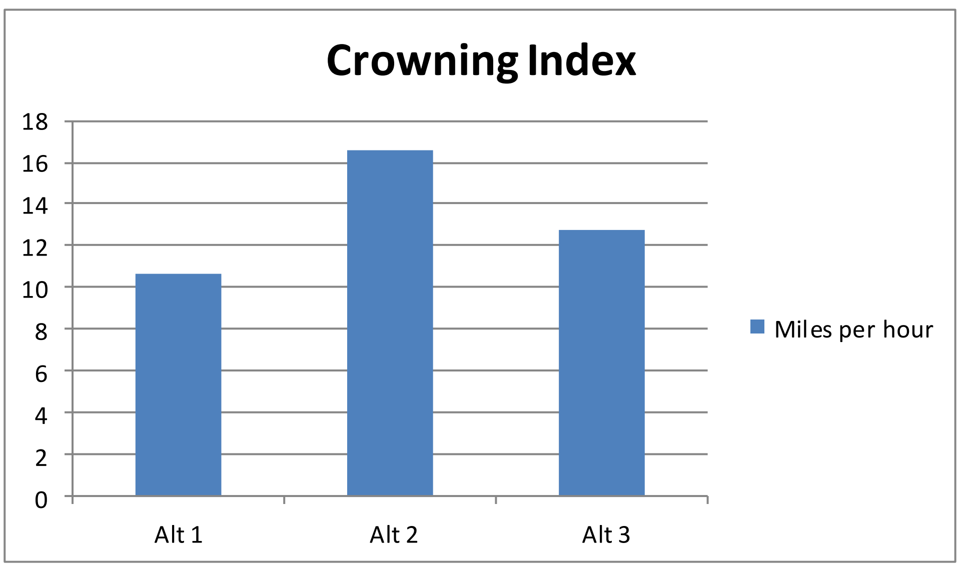
Figure 31 and Figure 32 is for a relative comparison of the alternatives for the two crown fire hazard indices because of the extreme range of values. Some stands have a 0% probability of torching and a torching index of 999 miles per hour. Whereas, other stands have a 100% probability of torching and a torching index of 0 miles per hour. The shrub fuel type and plantations mixed with chaparral are not included in this weighed average because it would show nearly 50% of the treatment area with a 0 mph torching index and flame lengths greater than the canopy base height.

Figure 30. Weighted average of the torching index in timber fuel types per alternative.



The torching index, which is the amount of wind required to transition a surface fire to a crown fire, is significantly increased in both the action alternatives.

Figure 31. Weighted average for the crowning index in timber fuel types per alternative



The FFE-FVS modeling compares the torching and crowning indices with the specified wind speed (90^{th} percentile) to determine the fire type. The four possible outcomes are listed below (FFE Guide pg. 49).

1) **Surface fires** -- crowns do not burn (if the specified wind speed is less than the torching index and the crowning index);

2) **Active crown fires** -- the fire moves through the tree crowns, burning all crowns in the stand (thus killing all trees); (specified wind speed is greater than the torching and crowning index) and

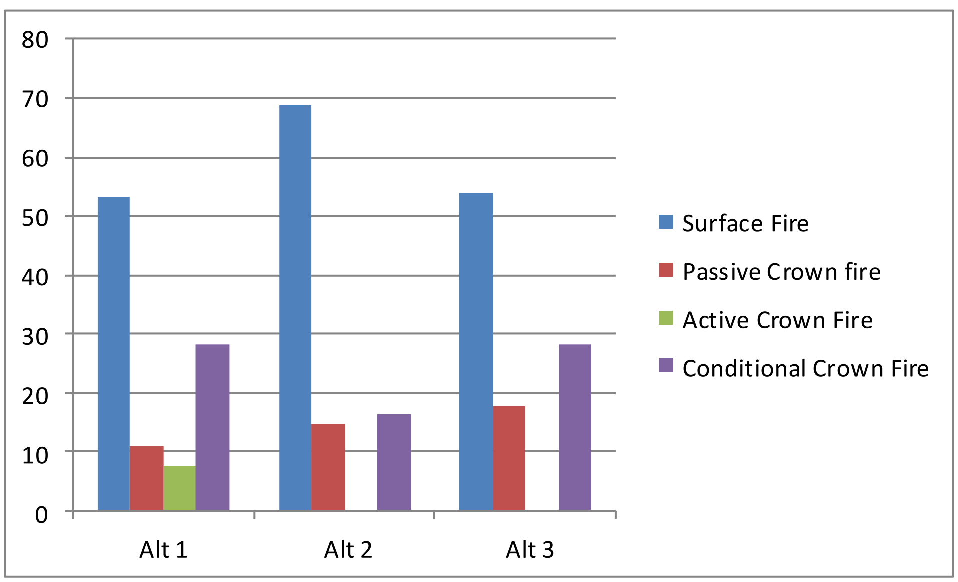
3) **Passive crown fires** -- some crowns will burn as individual trees or groups of trees torch (specified wind speed is greater than the torching index but less than the crowning index).

4) **Conditional crown fires --** if the fire begins as a surface fire then it is expected to remain so. If it begins as an active crown fire in an adjacent stands, then it may continue to spread as an active crown fire (specified wind speed is greater than the crowning index but less than the torching index). FFE models this fire type as an active crown fire, in terms of the flame lengths, mortality, and other fire effects.

Table 41. Rules for determining the occurrence of crowning (FFE Guide pg. 49).

	Torching Index < Wind Speed	**Torching Index > Wind Speed**
Crowning Index > Wind Speed	PASSIVE (P)	SURFACE (S)
Crowning Index < Wind Speed	ACTIVE (A)	CONDITIONAL (C)

Figure 32. Comparison of fire types by percent area in treated timber units under 90th Percentile Condition



Flame Length

Flame lengths are a measure of how intense or severe a fire may become and a proxy for ease of fire suppression. The following Table 42 is from Appendix B of the Fireline Hand Book (NWCG 2004) that is used as a general guide to determine fire hazard or degree of resistance to control as it refers to fire suppression.

Table 42. Resistance to control, or difficulty in obtaining fire suppression objectives.

Resistance to Control	Flame Length (feet)	Fireline Intensity (BTU/FT/S)	Possible Methods of Attack	Minimum Types of Resources and Location of Control Lines
Low	0-4	0-100	Direct	Hand/ground crews at fire edge.
Moderate	4-8	100-500	Direct/Indirect	Mechanized equipment supported by hand/ground crews at fire edge.
High	8-12	500-1000	Indirect	Primarily an indirect attack with line construction away from fire edge using a combination of aerial resources, mechanized equipment and hand/ground crews.
Extreme	>12	>1000	Indirect	Indirect attack is only option with line construction away from fire edge using a combination of aerial resources, mechanized equipment and hand/ground crews.

Figures 34 and 35 compares the flame lengths for the three alternatives. The weighted averages for these outputs do not include stands comprised of shrub or plantations mixed with shrubs; they will be analyzed separately from the timber fuel types. The surface flame length does not take any crown fire activity into account. The total flame length is calculated by taking both the surface flame length and crown fire activity into account. The modeling shows the surface flame length is reduced in both the action alternatives, but more in alternative 3. Fuel treatments that reduce the canopy will often have an increase in eye-level winds and the solar heating of fuels which can increase surface flame lengths. The total flame length, which takes a crown fire into account, is reduced more in alternative 2 because of the reduction in crown fire potential.

Figure 33. Displays the weighted average for surface flame lengths of timber fuel types.

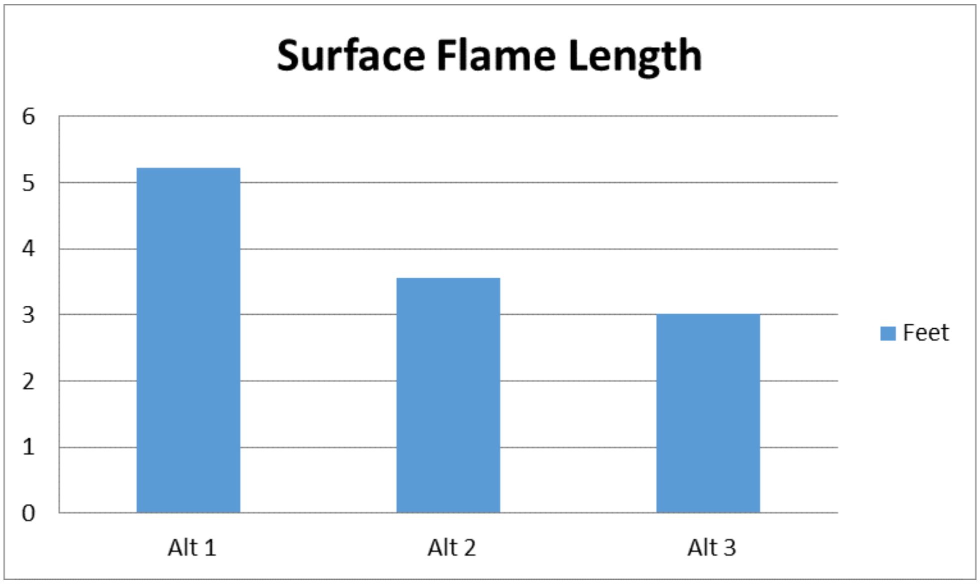
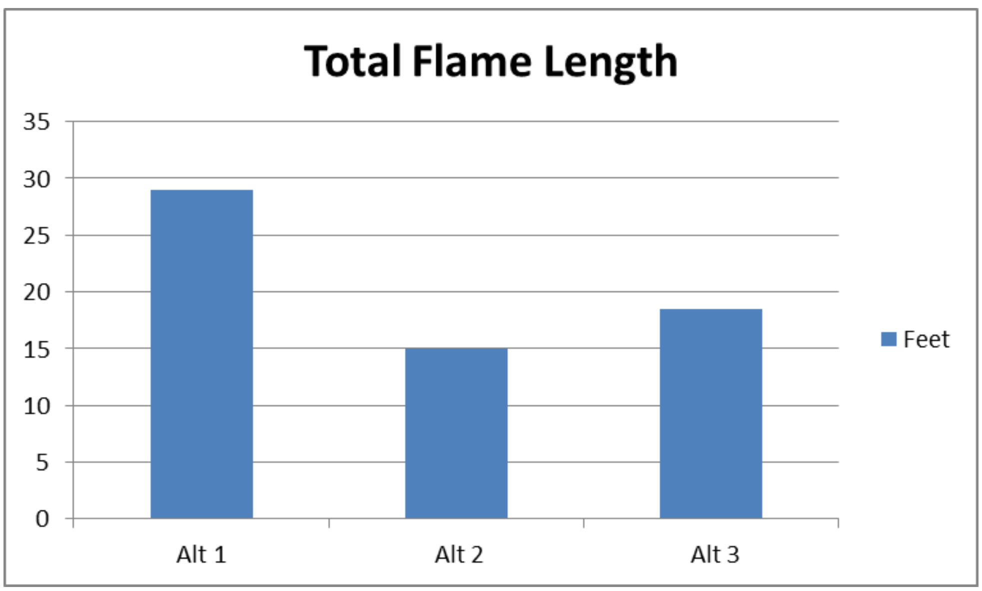


Figure 34. Displays the weighted average of the total flame lengths which includes both surface flame lengths and crown fire activity.



SHRUBS AND PLANTATIONS MIXED WITH SHRUBS

The preceding modeling for canopy base height, canopy bulk density, torching index, crowning index, fire type, surface flame length and total flame length did not include areas dominated by shrubs and plantations. Within the project area, there are 3,300 acres that were burned with a stand replacing fire during the 1990 Stormy Fire. Most of this area now consists of brush mixed with immature stands that were either naturally regenerated or planted. These stands are overly dense and average 609 trees per acre. The project proposes to treat 2,623 acres of this shrub/plantation fuel type which is 53 percent of the 4,897 total treatment acres. This shrub/plantation fuel type was analyzed separately and is not included in the weighted averages of the timber fuel types to avoid skewing the data towards the outputs listed in Table 43 below.

Table 43. Modeling outputs for shrub/plantation fuel types.

	Alternative 1 (no action)	Alternative 2 and 3
Canopy Base Height (feet)	2	4
Canopy bulk density (kilograms per cubic meter)	0.015	.0111
Torching Index (miles per hour)	0	0
Crowning Index (miles per hour)	71.1	90.6
Fire Type	Passive crown fire	Passive crown fire
Surface Flame Length (feet)	15.3	3.7
Total Flame Length (feet)	**18**	**4**

Fire Line Production Rates

Reduced fuel loading creates the ability for hand crews to construct fire control lines more rapidly. Fireline production rates for various resources and fuel types are listed in the Fireline Handbook (NWCG 2004). Type 1 crew production rates for the fuel models in the action alternatives were compared to the no action. A weighted average, including the shrub fuel model, showed a 28 percent and 23 percent increase in production rates for alternative 2 and 3 respectively. I suspect the production rate increases would be higher than what is listed in the tables because of the abundance of white thorn in the treatment areas. The production table generically groups chaparral and doesn't account for the difficulty of cutting line through white thorn which accounts for 53 percent of the treated acres.

Vegetation/Silviculture

Environmental Consequences

Relevance of Forest Vegetation Changes

The driver for desired conditions is wildlife habitat, particularly for fisher and spotted owl. This is covered in great detail in the biological evaluation. Both of these species need dense stands of large trees, but with enough dense small trees and brush to provide hiding cover and a prey base. The expected change in forest vegetation will increase the sustainability of stands of trees and a decrease in the likelihood of stand replacing fire. The heterogeneity of the structure and species composition will also increase.

Issues

One issue raise by a public comment was a request that we should conduct an analysis of not removing any trees large enough to have any commercial value. This was the genesis of alternative 3. Another issue was how to develop a treatment that all at one time addressed the need to reduce fuel and stand density while retaining high levels of canopy closure and large woody debris.

Figure 36. Jeffrey pine stand on the main Greenhorn mountain ridge

Additional Mitigation

Survey logged units for regeneration two growing seasons after slash is burned. Plant openings if regeneration is adequate, particularly for sugar pine and black oak.

Economics

Environmental Consequences

Alternative 1 – No Action

Under the No Action Alternative, there would be no timber harvest, no vegetation treatment and no additional road maintenance. No costs would be incurred and no revenue earned from sale of timber. Roads would be maintained under the annual road maintenance schedule as limited funds are available. No additional road maintenance or road improvements would be done and roads not needed for future management would not be decommissioned to improve soil and water quality.

Alternative 2 – Proposed Action

Under alternative 2, forest stands would be thinned to restore a healthy, diverse, fire-resistant forest structure. Vegetation treatments would reduce tree density, reduce fuel loads, and modify species composition. Estimated $1,599,317 (delivered sawlog value) revenue would be realized from sale of sawlogs.

PROPOSED VEGETATION TREATMENTS INCLUDE THE FOLLOWING:

- Restoration thinning would support uneven-aged forest structure to accelerate late successional growth. Mechanical thinning would remove overcrowded trees between 10 and 30 inches in diameter in mixed conifer and plantation stands, while favoring fire-resistant oak and pine. This treatment would promote healthy fire-resistant stands and large tree characteristics. It would provide for structural diversity, while maintaining key wildlife habitat structures such as large live trees, snags, and downed logs. Mechanical thinning would be implemented with a commercial timber sale.
- Fuel treatment would include prescribed burning and mechanical and hand thinning trees, to increase forest stand heterogeneity and reduce fuels. Thinning would help release naturally-regenerated or planted pine, fir, and oak trees. Fuel treatments would include pile and burn, masticate, and firewood removal. Prescribed burning would be done on the majority of the project area when weather and fuel conditions are appropriate to meet fuel load reduction objectives. Burning would be accomplished over a period of 10 years, to re-introducing fire to the project area. Prescribed burning is planned on areas with other vegetation treatments to maximize the effectiveness of fuel reduction and to help restore diverse vegetation age classes, tree sizes, and species composition.
- Live and recently dead understory trees proposed for removal on parts of the project area could be offered as sawlogs under favorable market conditions, or offered as other products. Sale and removal of forest products would help meet Forest Plan allowable sale quantity goals and desired future condition of the forest.

There are about 50 miles of system road in the project area. The existing road system, with proposed temporary roads, is adequate for proposed project treatment activities. About 28 miles of existing National Forest system roads would be maintained and used for equipment access and hauling timber products.

About 1.78 miles of existing, unauthorized roads, would be opened, improved and used for hauling products. About 3.70 miles of temporary roads would be constructed to access harvest units. All temporary roads, including unauthorized roads used for harvest, would be closed and disturbed areas restored (decommissioned) after operations are complete.

About 11.29 miles of system roads no longer needed for resource management would be decommissioned. About 3.66 miles, of the 11.29 miles, would be used for harvest operations and decommissioned after treatment operations are complete. About 2.7 of the 11.29 miles would be converted to trails. No other permanent system road changes are proposed on the Tobias project. Total system road miles would be reduced from about 50 to 39 miles. Road density in the project area would be reduced from 2.9 miles/square mile to 2.25.

Prescribed burn is proposed on 4,898 acres under alternatives 2 and 3. Prescribed burning proposed on 4,898 acres, would follow harvest and other mechanical treatments to further reduce fuels.

Hand and mechanical treatments would include cutting live and dead trees. Merchantable cut trees would be removed as sawlogs or other products from harvest units. Submerchantable trees and other fuels would be treated on site. Treatment areas are displayed on maps in Appendix A.

Alternative 2 activities include:

Harvest (commercial thin) 1,117 acres

Open for use and restore about 1.78 miles of existing unauthorized roads

Construct and restore about 3.70 miles of temporary roads

Hand fell excess small diameter trees (thin) 1,239 acres

Hand pile slash concentrations on 1,239 acres

Machine pile slash concentrations on 600 acres

Chip slash on 120 acres

Burn piles on 1,839 acres

Masticate small trees and shrubs on 2,158 acres

Underburn 384 acres

Prescribe burn 4,898 acres

Decommission 11.29 miles of system road

Alternative 3

Under Alternative 3, hand treatment and mastication would be used to thin trees (less than 10 inches dbh) and shrubs. Prescribed fire would be used to reduce fuels. Personal firewood gathering would be permitted from treated areas. No commercial products would be removed.

Alternative 3 activities include:

Fell excess small diameter trees (thin) 1,636 acres

Hand pile slash concentrations on 1,516 acres

Burn piles on 1,516

Masticate small trees and shrubs on 2,878 acres

Underburn 384 acres

Prescribe burn, 4,898 acres

Decommission 11.29 miles of system road

Activity summary under Alternatives 2 and 3

Table 44. Proposed activities under alternatives 2 and 3

Activity	Alternative 2	Alternative 3
Ground-based skidding harvest	720 acres	0
Skyline yarding harvest	397 acres	0
Improve and maintain haul route roads	29 miles	0
Open existing non-system roads for use and restore sites[a]	1.78 miles	0
Construct and restore temporary roads	3.70 miles	0
Hand fell sub-merchantable trees, thin	1239 acres	1636 acres
Hand pile slash	1239 acres	1516 acres

Machine pile slash	600 acres	0
Chip slash	120 acres	120 acres
Burn piles	1839 acres	1516 acres
Under burn	384 acres	384 acres
Masticate fuels	2158 acres	2878 acres
Decommission system roads	11.29 miles	11.29 miles
Convert system road to trail	2.73 miles	2.73 miles
Prescribe burn	4898 acres	4898 acres
Total area treated	5412 acres	5412 acres

[a]Unauthorized roads proposed to be used and sites (road beds) restored after use

CUMULATIVE EFFECTS

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Transportation, operations and economic cumulative effects analysis area is the project boundary and haul roads outside of the Tobias project area. Most project activities would be completed five years after the record of decision is signed, prescribed burning could take up to 10 years to complete.

Cumulative effects of felling, yarding, processing trees, hauling and on-site fuel treatments were determined for activities in the project area and would be added to past and foreseeable future harvest and other vegetation treatment areas for soil, water and other resource effects analysis. Transportation system cumulative effects would include past, present and foreseeable future or continued ongoing road maintenance. Maintenance is scheduled according to need and maintenance level, for each road, as funding becomes available and as roads are prioritized for resource protection and user safety.

Soil and water would benefit from road maintenance, drainage feature upkeep and improvements. Most removal area access is on existing system roads, however, 3.7 mile of temporary road construction and 1.78 miles of existing non-system road use are proposed under alternative 2. Temporary roads would be restored after operations are complete. Temporary roads would not be added to the transportation system. Ground-based harvest equipment would operate on old skid trails and old, existing landings, where harvest has occurred in the past, would be reused where appropriate. Temporary roads, skid trails and landing disturbed areas would be restored and seeded within one or two seasons. Vegetation recovery on temporary road cleared areas would be long term.

Soil and vegetation cover disturbed areas (acres) from temporary road construction, skidding, landing clearing, slash piling and pile burning are displayed in Table 44.

About 11.29 miles of system roads no longer needed for resource management would be decommissioned. No other permanent system road changes are proposed. Total system road miles in the project area would be reduced from about 50 to 39 miles. Road density in the project area would be reduced from 2.9 miles/square mile to 2.3.

Alternative 1 (no action) and alternative 3 would not provide any timber volume toward the Forest's allowable sale quantity (USDA 1988). Alternative 2 would contribute approximately 11,170 CCF commercial sawlog volume to the Sequoia NF LRMP allowable sale quantity (USDA 1988). Alternative 2 would generate $1,599,317 delivered sawlog value revenue. No commercial sawlogs would be harvested under no action alternative 1 or alternative 3.

Financial efficiency for timber harvest related costs and revenues under alternative 2 indicate a 1.01 benefit/cost ratio. Alternative 2 total project activity cost and revenue is financially inefficient with a PNV ratio less than one (sawlog values, timber harvest related and fuel reduction activity costs). Under no action alternative 1 and alternative 3 no harvest is planned, no revenue is generated. Alternative 2 has the highest project PNV, -$4,054,058. Under alternative 3, the total project PNV is -$4,180,969, with no commercial harvest and no delivered sawlog value. The no action alternative has no activity costs (other than planning cost) or revenues associated with it.

Economics Summary

Operations Effects on Vegetation and Soil

Temporary road construction, yarding (landings and skid trails), road decommissioning and pile burning and mastication operations would disturb vegetation, compact or displace soil. A summary of areas where vegetation cover would be removed, soil disturbed or displaced, is displayed in Table 45.

Table 45. Operations disturbance to vegetation cover and soils

Activity	Alternative 2			Alternative 3		
	Acres affected	% of Area affected	Acres disturbed	Acres affected	% of area affected	Acres disturbed
Temporary road construction, 3.73 miles alt 2,	9	100	9	-	-	-
Open existing non-system roads, close and restore sites, 1.78 miles	3	100	3	-	-	-
Ground-based skidding (landings and main skid trails)	720[a]	12	86	-	-	-
Skyline yarding (corridors and landings)	397[a]	3	12	-	-	-
Masticate fuels	2158	3	65	2878	3	86
Machine pile	609	4	24	-	-	-
Decommission system roads, 11.29 miles[b] (Convert 2.73 miles to trail)	22	55	12	22	55	12
Total	-		199	-		98

[a]Harvest treatment acres.; [b]Estimate 50 % of the 14 foot wide road bed would be disturbed.

Under alternative 2 soil and vegetation cover disturbance would occur on an estimated 199 acres, 2 percent of the project area. Under alternative 3 about 98 acres, 1 percent of the project area would be affected.

Timber Sale Economic Evaluation

Timber Sale Economic Evaluation (Version 3.0, 08-2015) indicated advertised rate would be $21.90/CCF. Predicted high bid is $24.33/CCF with stumpage valued at $271,766.

Timber Harvest Financial Efficiency

Financial efficiency for timber harvest activities through QuickSilver under alternative 2 indicates a 1.01 benefit/cost ratio, present net value $15,379, with present value benefits (discounted delivered log value) $1,599,317 and present value costs (logging costs) $1,583,938. There are no harvest costs and no revenues under alternative 3.

Total timber harvest costs and benefits related to financial efficiency are included in Table 46. Other project fuel reduction costs are not included in the timber harvest benefit/cost ratio. No harvest is planned under alternatives 1 and 3.

Table 46. Alternative 2 timber harvest financial efficiency

Alternative	Discount %	Discounted Cost $	Discounted Revenues $	Net Present Value $	Benefit/Cost Ratio
1	-	-	-	-	N/A
2	4	1,583,938	1,599,317	15,379	1.01
3	-	-	-	-	N/A

Total Project Financial Efficiency

For all project costs and benefits, alternative 2 benefit/cost ratio is 0.28. No timber harvest is planned under alternative 3, there would be no economic benefits. Total project costs, discounted to 2015, are $5,653,375 for alternative 2 and $4,180,969 for alternative 3. Project PNV is -$4,054,058 for alternative 2 and -$4,180,969 for alternative 3. Total project activity costs are itemized and displayed in appendix B.

SOILS

ENVIRONMENTAL CONSEQUENCES

The project proposal could affect soil productivity in the Tobias Project by reducing 1) soil cover, 2) soil porosity, 3) large woody debris (LWD) and 4) disturbance of surface soils.

1) One soil physical property that can be affected by the proposed action is porosity, the space between individual soil particles. Soil hydrologic function is primarily dependent on the size and arrangement of soil pores, or pore geometry. Soil pore geometry also controls the transmission of air through soils, which is critical for plant growth. When porosity is decreased, the soil becomes denser, making it more difficult for roots to penetrate. Maintenance of natural soil porosity is important for maintaining healthy native plant communities and for maintaining the hydrologic function of the soil. Severe losses of porosity through soil compaction decrease the water and air available to plant roots, creating droughty and/or anaerobic conditions as well as inhibiting root growth. Soil hydrologic function is usually impaired as water storage capacity, infiltration and permeability decrease, as a consequence increasing runoff and the subsequent potential for erosion and cumulative watershed effects.

Soil compaction diminishes soil porosity, and decreases the transmission of water, nutrients and air to roots. Severe compaction can inhibit root growth when the soil becomes too dense for roots to penetrate easily. Finally, compaction decreases infiltration and hydraulic conductivity, the movement of water into and through soils, which in turn increases surface runoff and erosion potential. Severely compacted soils could take at least 50 years to recover. Bulk density (ratio of soil mass to soil volume) and soil strength (penetration resistance) are two widely accepted indirect means of measuring changes in porosity in the field. Qualitative indicators of compaction include platy soil structure, loss of soil structure (e.g. puddling), impressions or ruts in the mineral soil surface, and in some cases, redoximorphic features that indicate a recent change in soil aeration. Redoximorphic features are soil properties associated with wetness that results from reduction and oxidation of iron and manganese compounds after saturation and desaturation with water. Both quantitative and qualitative indicators will be used to describe compaction.

Use of heavy equipment, especially rubber-tired skidders, for logging and tractor piling could compact soils, in the upper 12 inches of the soil profile. Soil compaction can have a detrimental effect on soil productivity on fine-textured soils that are moist or at optimal soil moisture conditions for soil compaction. Soil compaction is not a concern in coarse textured soils. In fact, soil compaction has been found to have an increase in soil productivity by increasing the available water holding capacity of the soil (Powers, et al 2008). Soils have been classified into sensitive and non-sensitive soils types for the purpose of identifying soils that are susceptible to detrimental soil compaction. Soil porosity should be at least 90 percent of total porosity over 85% of an activity area (stand) found under natural conditions. A ten percent reduction in total soil porosity corresponds to a threshold for soil bulk density that indicates detrimental soil compaction.

2) Soil productivity is dependent on the amount of soil organic matter available to prevent significant short or long-term nutrient cycle deficits, and to avoid detrimental physical and biological soil conditions. Soil organic matter should include fine organic matter and large woody debris.

> **a.** Fine organic matter provides soil nutrients and protects the soil by providing soil cover. Soil cover or the lack of soil cover can affect soil productivity by removal of surface soils from accelerated erosion. Accelerated erosion is erosion that occurs at a rate over and beyond normal, natural or geological erosion, primarily as a result of human activity. Soil loss should not exceed the rate of soil formation (approximately the long-term average of 1 ton/acre/year). Sufficient soil cover should be maintained to prevent accelerated soil erosion from exceeding the rate of soil formation. Ground cover will be at least 50% on ground slopes less than 35% and on slopes greater than 35%, ground cover will be at least 60% (Busse, Hubbert, Moghaddas, 2014). Replenishment of fine organic matter to preexisting conditions could occur in less than 10 years as forests shed their needles and leaves and accumulate on the forest floor.

> **b.** Large organic matter or large woody debris, provides habitat for soil micro-organisms including fungus, soil insects and soil bacteria. All of these organisms are critical for soil health and soil productivity. The loss or reduction of large woody debris in a forest could last anywhere from 10 to 50 years, depending on the number of decadent trees or snags that are left in the stand after treatment. At least 5 well distributed logs per acre, representing the range of decompositions classes, should be left on the forest floor after the proposed action is completed.

3) Soil productivity can be reduced or impacted from displacement of surface soils. Surface soils include valuable amounts of organic matter and nutrients that are critical for productive soils. Surface soils can be disturbed by logging and mastication equipment operating in the forest, by tractors piling slash, cable yarded logs creating linear gouges and by construction of roads and skid roads from excavation of the soil to construct a road or skid trail prism. The surface area of new roads will result in a loss of soil productivity for that area.

4) Disturbance of surface soils by tractor and cable logging and mastication equipment could result in reduced soil productivity. The Sequoia LRMP provides direction for avoiding tractor logging on sustained slopes that exceed 35%. There are no slope limitations for mastication equipment in the LRMP. Mastication equipment can operate on slopes greater than 35% under normal, dry soil moisture conditions. During times of increased soil moisture content, mastication equipment operating on slopes greater than 35% will cause additional soil disturbances, increasing the likelihood of soil compaction and the formation of ruts and track incision. Cable yarded logging has the potential to create significant amounts of soil disturbance just below the landings and blind-lead situations can generate large amounts of soil displacement where turns of logs create long, linear gouges. Partially suspended logs should be monitored to reduce impact of gouging.

Direct and Indirect Effects by Alternative

Alternative 1: No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. No ecological restoration activities would be implemented to accomplish the purpose and need. Under alternative 1, soil conditions will not change from the current existing condition barring the implementation of approved OHV trail standards. Currently both percent soil cover and large woody debris (LWD) meet the regional soil standard and guideline threshold values. As previously discussed two of the soil transects (T-7 and T-14) were evaluated as being entirely of natural condition (D0), fifteen soil transects (T-1, T-3, T-4, T-5, T-6, T-8, T-9, T-10, T-11, T-12, T-13, T-15, T-16, T-17 and T-18) showed faint signs of entry (D1), nine soil transects (T-1, T-3, T-5, T-6, T-8, T-10, T-16, T-17 and T-18) showed obvious signs of entry (D2) and four soil transects (T-3, T-8, T-10 and T-17) showed extensive signs of entry (D3). The disturbance ratings can be attributed to several factors including old skid trails and landings, evidence of fire and OHV trails. Any signs of erosion appeared to be recent and related to motorbike trails. However, observing the individual transects as a whole results in all 17 transects exhibiting a disturbance class equal to natural condition (D0).

Road decommissioning would not occur on 11.29 miles of forest roads and 19.16 acres of forest soils would not be in production as compared to Alternatives B and C.   The proposed roads for decommissioning would continue to be in the Forest Road system and should be evaluated on a periodic basis and possibly be maintained to prevent soil resource damage. These roads include: 24815A, 24824A, 24825A, 24825B, 24834A, 24835C, 24837, 24837A, 24845, 24845A, 24846A, 24880A, 24880B, 24880C, 24883A, 24880 and 24883.

Alternative 2: Commercial Treatments

Commercial Treatments

Areas planned for commercial fuels reduction treatments include tractor (ground-based skidding), skyline (cable yarding) and off-road skyline yarding. Temporary roads both new (3.73 miles) and reconstructed (1.51 miles) will be created to facilitate the commercial treatments. Approximately forty-seven existing landings and seven hot deck areas have been identified. The location and amount of landings used may differ depending on operator needs. Each of these activities has varying potential to produce adverse effects on soil resources via mechanical disturbance, soil compaction and reduced soil cover.

Road construction will consist of 3.73 miles of new temporary roads and 1.51 miles of reconstructed existing temporary roads. The acreage of the proposed temporary road construction was estimated based on the measured length and an estimated width (14 ft. wide bed+2 ft. wide cut+10 ft. wide fill above and below road) of 26 feet. Assuming an average width of 26 feet, the new road construction will disturb approximately 11.76 acres of previously undisturbed soils within stands 22, 23, 24, 25, 29 and 31. Construction of these new roads will result in soil displacement and compaction. Temporary road reconstruction will involve vegetation clearing and road blading of approximately 1.51 miles or approximately 4.8 acres of soils within stands 4, 8, 9, 21, 22, 24, 25, 30, 31, 36, 37 and 38. When applicable it is best to use old temporary roads and old skid trails to minimize the impacts to the soil resource. If soil compaction becomes evident among 15% of the treatment area then subsoiling of the temporary roads, skid trails and/or landings will need to be completed. Of the soil transects only 10.5% of points surveyed exhibited resistance to penetration and 3.5% showed soil structural indicators of compaction. Therefore, the likelihood of soil compaction exceeding 15% of a treatment area is minute, but is most likely to occur on Holland soils, specifically in stands 36 and 40 where temporary road reconstruction, skid trails and landings are proposed.

Ground-based harvest removal operations will occur on slopes less than 35% and on small areas (<10%) between 35 and 50 percent slopes. Mechanical equipment operations should be conducted (mechanical thinning and biomass removal equipment, log skidders and tractor-piling operations) when the soil is sufficiently dry in the top 12 inches to prevent unacceptable loss of soil porosity (soil compaction) or soil disturbance. Maintain 90% of the soil porosity over 85% of an activity area. In areas planned for commercial thinning, a minimum of 50% ground cover should be left on the ground to prevent accelerated erosion. Where shrub species predominate, attempt crushing before piling to create small woody fragments left scattered over the site for soil cover and erosion protection. If slopes are greater than 35%, soil cover should be at least 60% (Busse, Hubbert and Moghaddas, 2014). Soil cover includes organic surface materials, living vegetation less than 3 feet tall (grasses, forbs and low growing shrubs), surface rock fragments larger than $^3/_4$ inch or where needed applied mulches. If ground cover (50% on slopes less than 35% and 60% on slopes greater than 35%) is not provided on disturbed ground, when intense precipitation occurs, accelerated erosion is likely to occur after October 15, leading to a decrease in both soil productivity and water quality. High precipitation events could occur after October 15 and possibly in the summer when concentrated summer convection storms could occur. Coarse fragments of organic material must also be retained and/or added to avoid a decrease in soil productivity; at least five well-distributed logs per acre as large woody debris (LWD) should remain post treatment. LWD should be at least 12 inches in diameter and 10 feet long or in the largest size classes representing the range of decomposition classes. A 100-foot buffer of 90% soil cover will be provided around rock outcrop to prevent accelerated erosion of the adjacent soils from rapid runoff from rock outcrops. The presence of rock outcrop was verified during field reconnaissance in stands 20, 21, 22, 23, 24, 29, 34 and 36. For stands including proposed ground-based treatments an aerial photo analysis was used to detect rock outcrop proximal to proposed ground-based treatments. The analysis revealed that stands 6, 8, 10, 13, 15-17, 21-25, 27, 29-31, 33-38 and 40 all contain visible rock outcrop. During times of increased soil moisture, increased amounts of soil disturbance will occur and an increased risk of soil compaction in soils with high clay contents will possibly occur. The only unit proposed for treatment with high clay content includes stand 36, which is proposed for tractor skidding on the Holland family soil. Soils must retain soil moisture content below 14% during ground based harvest operations to minimize the potential of detrimental soil disturbance and/or compaction. Although unlikely, areas where soil compaction exceeds 15% of a treatment area, skid roads and trails must be subsoiled and water barred. A loss in soil productivity could occur in areas where sensitive soils are located during most soil disturbing activities if design measures are not followed.

Ground-based treatments proposed on slopes greater than 35% have an increased risk of detrimental soil disturbance. Stands including proposed treatments on slopes greater than 35% include 16, 21-25, 29-31, 33, 34, 36 and 38. If the current proposed treatment plan is followed, all proposed ground based treatment areas, except for stand 24, encompass areas less than the desired threshold of 10% area. Areas located on steep 25% - 35% slopes where skidding may be adverse (uphill skidding) could result in increased amounts of ground disturbance. An estimated 125 acres of soil with an average slope of 20% will be affected by adverse skidding. Stands with potential adverse skidding include 16, 21, 22, 23, 25, 31, 33, 34, 36 and 38. Within the stands, adverse skidding is most likely to occur in areas where skidding to destination roads or landings is uphill from the felling area- the associated landing numbers include 6, 8, 9, 10, 11, 13, 14, 16, 17, 18, 22, 24, 25, 32, 35, 36, 38, 40, 45. Landings with average slopes greater than 20% include 8, 10, 17, 24, 36, 38, 40 and 45. Adverse skidding should be avoided to minimize ground disturbance, but if necessary resulting detrimental soil effects should be mitigated. Mitigation includes maintaining soil cover to meet the standard of 50% cover on slopes less than 35% and 60% on slopes greater than 35% as well as reshaping any slopes with ruts greater in depth than 6 inches.

Skyline cable yarding is proposed on approximately 355 acres. This treatment will occur on slopes greater than 35% and is intended for uphill yarding distances less than 1,000 feet. The landings will be located along existing roads and proposed temporary roads at each skyline set, which will be spaced approximately 150 feet apart. Fan sets on ridge points, where volume is concentrated, could require larger landing areas, up to $^1/_4$ acre, to accommodate hot decking and/or swing skidding for material handling.

Off-road skyline yarding is proposed on approximately 42 acres within stands 21, 22, 31 and 33. The off-road skyline treatment includes the operation of a yarding machine that would operate from skid trails. The cut trees would be tractor swing skidded to the landings located adjacent to existing or proposed temporary roads. This treatment includes the excavation of approximately 1610 feet (0.31 miles) of twelve foot wide off-road yarder access trails. These trails would be excavated on 25 to 35 percent side slopes to accommodate yarder and skidder travel.

Cable yarding systems generally result in much less site and soil disturbance than ground-based yarding; however, significant amounts of soil disturbance are still likely proximal to the cable yarding landings, hot decks and/or fan sets on ridge tops which could result in accelerated surface erosion and compaction (Robichaud, MacDonald and Foltz, 2010; Laffan et al., 2000; and Reeves et al., 2011). Furthermore, long linear gouges beneath cables could result in removal of soil cover and surface soil horizons which may induce accelerated erosion and/or reduce soil productivity. The high traffic areas, should only be used when soil moisture content is below 14-16%. Any loss in surface cover should be maintained to meet the standard of 50% cover on slopes less than 35% and 60% on slopes greater than 35%. Any linear gouges caused by dragging of cable yarded logs greater than or equal to 10 feet long and six inches deep in top soil (as opposed to litter or duff) would be rehabilitated to replace soil and provide a minimum of 50% ground cover.

Piling of slash and subsequent burning will result in short term losses in soil productivity of approximately 4.7 percent (2034 ft^2) of every acre that is machine and hand piled and burning is implemented. This value is based on 18, 12-foot diameter piles per acre. Therefore, based on all 1,839 proposed piling acres, a maximum estimate of 86 acres of soil will be disturbed. This loss in productivity beneath the burn piles is likely to inhibit plant growth for a 2 to 3 year minimum. To minimize effects to soil, burning of piles should occur when soil is moist (at least 20 percent moisture by volume) and piles should contain a mixture of fuel sizes as this generally does not produce excessive soil temperatures or changes in soil functioning (Busse, Hubbert, and Moghaddas, 2014). This is not required as a design measure, but should be attempted during pile burning planning.

Non-Commercial Treatments

Areas planned for non-commercial fuels reduction treatments include 385 acres of understory prescribed burning, 2,158 acres of masticating, 1,239 acres of hand thinning and 11.29 miles of road decommissioning. Any prescribed burning should be maintained at a low to moderate burning severity to avoid complete forest floor consumption and mineral soil damage. When possible, burn when soils are moist (>20 percent by volume) to limit heat penetration. Prescribed fire at low burn intensities will maintain the required 50% soil cover to minimize soil loss and fine root mortality (Busse, Hubbert, and Moghaddas, 2014).

Hand thinning will have zero to minimal adverse effect on the soil so long as the soil cover is maintained at the minimum 50% for slopes less than 35% and 60% for slopes greater than 35%.

Masticator equipment reduces erosion potential by increasing soil cover and generally causes little soil disturbance and compaction. Masticating equipment normally does not result in compacted soils because the equipment has a lower ground pressure than conventional logging equipment. In addition the masticator creates a bed of chips, which acts like a carpet the masticator travels over reducing the ground pressure on the soils below. Mastication on steeper slopes (>35%) is proposed in stands 2, 4, 6, 8-22, 25-38, and 40 and could result in the formation of soil troughs where the masticator is traveling straight up or down steep slopes. These troughs could be sites of concentrated flow and could create rill and gully erosion if adequate erosion control is not provided. These troughs should be reshaped or adequate erosion control should be provided to prevent accelerated erosion. Additionally the number of turns the masticator takes needs to be minimized to reduce the soil disturbance which occurs when tracked equipment rotates. Areas planned for mastication pose little risk of reducing soil productivity if BMP’s are implemented.

Most mastication treatments will be on slopes less the 45%; however some areas with slopes in excess of 45% will be treated. Additional soil disturbances will occur in these areas above 45%, most commonly deep tread incision and increased occurrences of soil compaction. Short sections of steep slopes, where equipment travels from vegetation patch to vegetation patch during mastication activity is acceptable, but longer sections of steep slopes need to be minimized on slopes greater than 45%.

Road Decommissioning (In Alternatives 2 and 3)

Road decommissioning would occur on 11.29 miles of forest roads, the roads selected for the decommissioning are forest roads 24815A, 24824A, 24825A, 24825B, 24834A, 24835C, 24837, 24837A, 24845, 24845A, 24846A, 24880A, 24880B, 24880C, 24883A, 24880 and 24883. Based on an average width of 14 feet, 19.16 acres of forest soils will be brought back into production after the restoration is complete. Soil productivity will not be restored to pre-road conditions because topsoil is not being restored. However, soil productivity will be increased over existing condition. Once the restoration is completed proper BMPs will need to be implemented to reduce the likelihood of accelerated erosion from occurring.

Alternative 3: Non-commercial Treatment Proposal

Non-Commercial Treatments

Areas proposed for understory prescribed burn are approximately 384 acres. Hand thinning is proposed on approximately 1,636 acres and mastication is proposed for 2,878 acres. Any prescribed burning should be maintained at a low to moderate burning severity to avoid complete forest floor consumption and mineral soil damage. When possible, burn when soils are moist (>20 percent by volume) to limit heat penetration. Prescribed fire at low burn intensities will maintain the required 50% soil cover to minimize soil loss and fine root mortality (Busse, Hubbert, and Moghaddas, 2014).

Prescribed fire on highly erosive soils may require additional water control features to minimize accelerated erosion and the formation of ruts and gullies.

Hand thinning will have zero to minimal adverse effect on the soil so long as the soil cover is maintained at the minimum 50% for slopes less than 35% and 60% for slopes greater than 35%.

Masticator equipment reduces erosion potential by increasing soil cover and generally causes little soil disturbance and compaction. Masticating equipment normally does not result in compacted soils because the equipment has a lower ground pressure than conventional logging equipment. In addition, the masticator creates a bed of chips, which acts like a carpet the masticator travels over reducing the ground pressure on the soils below. Mastication on steeper slopes (>35%) is proposed in stands 2, 4, 6, 8-22, 25-38, and 40 and could result in the formation of soil troughs where the masticator is traveling straight up or down steep slopes. These troughs could be sites of concentrated flow and could create rill and gully erosion if adequate erosion control is not provided. These troughs should be reshaped or adequate erosion control should be provided to prevent accelerated erosion. Additionally the number of turns the masticator takes needs to be minimized to reduce the soil disturbance which occurs when tracked equipment rotates. Areas planned for mastication pose little risk of reducing soil productivity if BMP's are implemented.

Most mastication treatments will be on slopes less the 45%; however some areas with slopes in excess of 45% will be treated. Additional soil disturbances will occur in these areas above 45%, most commonly deep tread incision and increased occurrences of soil compaction. To avoid adverse soil disturbance, the soils would need to have soil moisture content at or below 14% to minimize the potential of detrimental soil disturbance. Short sections of steep slopes, where equipment travels from vegetation patch to vegetation patch during mastication activity is acceptable, but longer sections of steep slopes need to be minimized on slopes greater than 45%.

Piling and subsequent burning will result in short term losses in soil productivity to approximately 5.8 percent (2512 ft^2) of every acre that pile burning is implemented. This value is based on 50, 8-foot diameter piles per acre. Therefore, based on all 1,516 proposed piling acres, a maximum estimate of 87 acres of soil will be disturbed. This loss in productivity beneath the burn piles is likely to inhibit plant growth for a 2 to 3 year minimum. To minimize effects to soil, burning of piles should occur when soil is moist (at least 20 percent moisture by volume) and piles should contain a mixture of fuel sizes as this generally does not produce excessive soil temperatures or changes in soil functioning (Busse, Hubbert, and Moghaddas, 2014).

Cumulative Effects

Alternative 1 – No Action

Cumulative soil effects have been addressed under the cumulative watershed effects (CWE) section under the Hydrology Section but are also based on evaluation within the activity area at the stand level. The CWE assessment uses the Equivalent Roaded Acre (ERA) Model, which quantifies disturbance based on the degree of soil disturbance, as compared to an acre of road and measured relative to disturbance in a given watershed. ERAs reflect changes to Soil Hydrologic Function, and are an indicator of rutting potential, erosion potential and loss of water control. See Tobias Ecological Restoration Project CWE Analysis for a full description of assessment and assumptions including lists of past, present and future foreseeable actions. The Forest Service Pacific Southwest Region (R5) methodology is used to determine the overall disturbance footprint. The disturbance footprint is a semi-quantitative measure of acres of detrimental soil disturbance and hence an approximation of change in Soil Quality as defined by the R5 Soil Desired Conditions. The Tobias Project includes twelve subwatersheds; 9CK-South Fork Ant Canyon, 9CM-Unnamed, 9CO-Stormy Canyon, 9DA-Dry

Meadow Creek, 9DB- Tyler Meadow Creek, 9DC-Schultz Creek, 9DD- Deep Creek, 9DE- Girl Scout Camp, 9DJ- Baker Creek, 9DM- South Bull Run Creek and 9DN- Unnnamed. The following list denotes which subwatersheds and soils within, (ERA) under the no action alternative, are likely to be disturbed; 9DA (66), 9DB (75), 9DD (8), 9DJ (27), 9DL (18), 9DE (7), 9DC (5), 9DM (4), 9DN (0), 9CO (0), 9CK and 9CM (0). Of these values, none exceed the TOC, so no cumulative watershed effects are anticipated. The ERA's from existing disturbances do not exceed 3% of the watershed area in total soil disturbance. Therefore, cumulative soil effects from past disturbances are not present based on the ERA Model. For details on the Cumulative Watershed Effects Analysis see the project hydrology report (Courter, 2015).

Alternative 2 – Commercial Treatments

Cumulative soil effects have been addressed under the cumulative watershed effects (CWE) section under the Hydrology/Water Quality Section. See the discussion in Alternative 1, Soil Cumulative Effects section for additional discussion on soil cumulative effects.

In addition to the CWE analysis, a review of the past, present, and reasonably foreseeable actions to take place within the project area concluded the actions are not anticipated to contribute to the overall cumulative effects to the soil resource. The soil's support for plant growth function, soil hydrologic function and filtering-buffering function would be maintained and minimal soil disturbance will occur. This is due to implementation of project design features and implementing Best Management Practices (BMPs) for this and any forthcoming projects within the project area. However if project design features and BMPs are not followed, ensuing detrimental effects to the soil resource will occur.

Cumulative soil effects include detrimental soil disturbance within a spatial scale bound by the extent of the treatment area or the stand level and a temporal scale of 30 to 50 years. The data from research on the subject shows that soil compaction and organic matter (OM) removal are important drivers in many ecosystem processes, and the maintenance of adequate soil porosity and OM content is important for continued site productivity and ecological function (Jurgensen and others 1997; Powers and others 2004). Specific long term consequences, within the temporal scale of 30 to 50 years, of OM removal remain uncertain; however, within a 10 year duration significant and universal declines in soil carbon concentration above 20-cm and reduced nitrogen availability related to surface OM removal were found (Powers et al, 2005). Furthermore, research suggests that soil carbon concentrations within a 10 year span depend only slightly on the decomposition of surface OM but primarily depend on the decay of the fine root fraction of the soil (Powers et al. 2005). Thus, prescribed burning and burning of slash piles must remain within the low to moderate burn severity thresholds to avoid detrimental losses in soil carbon.

The discussion of soil compaction over a 30 to 50 year time span involves several topics including: (1) effect of compaction on soil productivity, (2) effect of compaction on infiltration rates and (3) density recovery time. Results of research on the topic of soil productivity and compaction indicate that soil compaction treatments do indeed increase density, but soil productivity decreases in compacted clayey soils and increases in compacted sandy soils (Powers et al., 2005). The sandy texture of the soils within the treatment areas, with the exception of the Holland soil, will be nominally susceptible to compaction and resulting adverse cumulative effects of soil productivity. The Holland soil is the most susceptible of all soils in the proposed treatment areas to compaction and adverse productivity effects. The clayey subsurface horizon found at a depth of approximately 8-60 inches is susceptible to compaction; however, it is important to note that compaction rarely exceeds a 12-inch depth (USDA FS, 1980). The primary cumulative effect of compaction on sandy soils within the project area will likely be a decrease in infiltration rates which often results in an increase in surface runoff and erosion rates. Considering compaction recovery rates of approximately fifty years for sandy soils, both productivity and infiltration rates should be considered (USDA FS, 1985).

Cumulative effects of soils related to temporary road construction include removal of the surface horizons which results in detrimental effects that span beyond the 30 to 50 year temporal scale. The removal of surface horizons will affect both the soils ability to support plant growth and hydrologic function. The exact amount of time required for soil formation is a complex matter that requires an in-depth analysis not pertinent to this project. However, the relative age of soils can be estimated based on the thickness and number of horizons. Therefore, it is generally maintained that the greater the thickness and intensity of horizonation the more mature is the soil (Jenny, 1941). As stated previously, the project area includes soils ranging in maturity, but a majority of the proposed roads will be constructed on Entisols which are moderately young soils with moderately developed subsurface horizons. The removal of surface horizons from these soils, as a result of new temporary road construction, would result in detrimental and irreversible effects to approximately 11.76 acres of previously undisturbed soils that would extend beyond the 50 year time span, regardless of mitigation.

Alternative 3 – Non- Treatments

Cumulative soil effects have been addressed under the cumulative watershed effects (CWE) section under the Hydrology/Water Quality Section. See the discussion in the Action Alternative 2, Soil Cumulative Effects section for additional discussion on soil cumulative effects.

In addition to the CWE analysis, a review of the past, present, and reasonably foreseeable actions to take place within the project area concluded the actions are not anticipated to contribute to the overall cumulative effects to the soil resource. The soil's support for plant growth function, soil hydrologic function and filtering-buffering function would be maintained and minimal soil disturbance will occur. This is due to implementation of project design features and implementing BMPs for this and any forthcoming projects within the project area. However if project design features and BMPs are not followed, ensuing detrimental effects to the soil resource will occur.

Numerous soil impacts can occur from hand thinning and burning treatments, but the impacts can be quite variable, depending on both manageable factors and inherent site sensitivity factors, which together dictate the severity and extent of compaction and burn severity. Manageable factors include equipment configuration and use, decisions on fuel arrangement and moisture levels, light-up sequence, and resulting fire behavior, all timed to take advantage of seasonal soil conditions to minimize impacts. Inherent site sensitivity depends on soil texture and mineralogy, coarse fragment content and arrangement, and organic matter levels and rooting, among other factors. No cumulative effects of compaction or burning related to hand thinning treatment are expected if mitigation measures are followed.

Non-commercial thinning operations (without yarding) have small, short-lived impacts on runoff and sediment production, even when operations extend over large areas. Low and moderate severity burns have much smaller effects on runoff and sediment yields. If areas are burned at low severity, the potential for increasing peak flows and erosion rates is relatively small. However, if prescribed fires are conducted under dry duff moisture conditions and larger areas are burned at high severity, there is a much greater risk for significantly increasing runoff and erosion rates.

Geology and Slope Stability

Environmental Consequences

Direct and Indirect Effects of Proposed Action

The proposed action that was assessed for slope stability in this alternative is the construction and use of the temporary roads on the east facing slopes of the Greenhorn Mountains and the decommissioning of those temporary roads and other existing roads that are proposed for decommissioning. This includes temporary roads T1, T2, T3, T4, T5, and T6 (see Figures 3, 4, and 5). All other proposed actions should have a negligible affect to slope stability.

Temporary Roads

There is approximately 3.46 miles of proposed new temporary roads that will be constructed and decommissioned after use. These roads are located on slopes that vary from gentle to steep. The road segments on slopes less than 30% should be stable with balanced sections between the road cut and the fill. The road cuts on these slopes should not exceed 3 feet high and few problems are anticipated. The road segments on slopes between 30% - 50% have a moderate potential for cut bank failures. These road segments could have road cuts 3-8 feet high depending on the constructed cut bank slope. Slopes that have deeper soils should have flatter cut bank slopes of $^{3}/_{4}$/:1. Road segments constructed through rock could have cut bank slopes of $^{1}/_{2}$:1, without slope stability problems. There could be minor rock fall occurring on these road segments. The road segments on steeper slopes up to 50%-60% have the highest potential for unstable slopes. These road segments may have excavations that could be 12 to 14 feet high. These slopes could also have rock fall hazards where the road is constructed in moderately weathered bedrock. It is expected that most of these road cuts would have shallow soil exposed in the top 36 inches of the cut and decomposed granite could extend down 60 inches. The lower half of these roads will be in rock. There may be a few pockets of deeply weather bedrock (saprolitic) along these temporary roads. These road segments should be constructed with cut slopes that could vary from ½:1 to $^{3}/_{4}$/:1. In addition, these road segments should have further analysis by a Geotechnical Engineer or an Engineering Geologist, after the pioneer road is constructed to determine if additional slope stability measures should be implemented.

Construction of temporary roads should include road design plans that indicate road segments with balanced fills, control of side cast, and designs showing cut bank and fill slope design angles. Road fills should be compacted to within 95% of the optimum soil moisture. Road material in the steeper road segments will need to be end hauled to minimize the amount of material that is sidecast. Some material will be sidecast as pioneer road construction is implemented. There may be a need to identify material disposal sites, but this could be minimal if the road is designed as balanced sections. Erosion control is critical to stabilize the newly constructed slopes and needs to be effectively implemented. An erosion control plan needs to stabilize all fill slopes and all slopes where side cast material was deposited. Assuming all the standard BMPs are implemented and standard road construction practices are adhered to, there should be minimal problems from slope stability.

Road Decommissioning

Road decommissioning would occur on 11.29 miles and 19.6 acres of forest roads in both action alternatives (2 and 3). These roads would be decommissioned and any potential slope instability problems from extreme precipitation events would be avoided from the implementation of the road decommissioning portion of this alternative. These roads include: 24815A, 24824A, 24825A, 24825B, 24834A, 24835C, 24837, 24837A, 24845, 24845A, 24846A, 24880A, 24880B, 24880C, 24883A, 24880 and 24883. Once the restoration is completed, proper BMPs will need to be implemented to reduce the likelihood of slope stability problems from occurring.

Cumulative Effects of Proposed Action

Cumulative soil effects have been addressed under the cumulative watershed effects (CWE) section under the Hydrology/Water Quality Section.

Cumulative effects to slope stability is expected to last from two to five years after the temporary roads are constructed and the time it takes for the roads to revegetate and completely stabilize. The temporary roads are proposed to be constructed and decommissioned all in the same season. The temporary roads will be decommissioned by restoring some hydrologic function to the slope. This includes eliminating all hydrologic conductivity of the road prism and providing for the evenly flow of water over the slopes, across and over the road prism.

Direct and Indirect Effects

The proposed action that was assessed for slope stability in alternative 3 is the decommissioning of existing roads that are proposed for decommissioning. This includes temporary roads T1, T2, T3, T4, T5, and T6. All other proposed actions should have a negligible affect to slope stability.

Cumulative Effects

Cumulative effects for slope stability have been addressed under the cumulative watershed effects (CWE) section under the Hydrology/Water Quality Section.

Watershed

Environmental Consequences

The proposed action has a non-commercial component. The following describes the activities proposed in the streamside management zones (SMZ), riparian conservation areas (RCA), and areas outside the SMZ's and RCA's. Riparian Conservation Areas (RCAs) are a land allocation developed for riparian dependent species which overlap all other land allocations (USDA 2004). RCA zones are not an area of exclusion but a place where proposed management activities are prescribed to maintain or move aquatic habitats toward the desired condition as described by the Aquatic Management Strategy (AMS) goals. Riparian Conservation Objectives (RCO's) provide direction for the RCA's and prescribe widths of 300 feet either side for perennial streams, 150 feet for seasonally flowing streams, and 150 feet for special aquatic features. Within the RCA allocation is nested a Streamside Management Zone (SMZ's). The SMZ is a variable zone designated along riparian areas developed with the objective of minimizing potential for adverse effects from adjacent management activity. Management within SMZ's is designated for the purpose of improving riparian values as shown in Table 1. SMZ widths are established for maintenance of stream banks, vegetative cover, protection of stream surface shade, and interception of sediment. SMZ widths vary depending on Stream Class and side slopes adjacent to a stream (See Appendix A of the Hydrologist report for detailed rationale and discussion, and Map X for SMZ adjusted widths based on slope and other factors).

All Alternatives

All action alternatives include mitigations to reduce soil transport, protect habitat, and promote good water quality. Forest Service Soil Quality Standards are used to minimize the mobility of sediment along the landscape. Streamside Management Zones (SMZ's) and Riparian Conservation Area's (RCA's) are located along streams, meadows, springs, and other special aquatic features to protect riparian and aquatic habitat from sediment. Best Management Practices (BMPs) minimize impacts to water quality by implementing mitigations before and during project implementation. The selected BMPs for the Tobias Project would require post-project effectiveness monitoring once the project is completed. These standards assist in reducing potential negative effects from actions/treatments being proposed in each alternative and are considered project design features. Project design features for hydrologic resources are included in the analysis for each alternative except the no action. Further detailed information regarding project design features can be read in Appendix A *Recommend Project Design Features for Tobias Ecosystem Restoration Project* section of this report.

Alternative 1 – No Action

Existing conditions such as water quality and channel stability would not change as a result of the No Action Alternative. Natural stable and naturally unstable channels would remain in the same condition. No potential increases in accelerated erosion and/or deposition into stream channels or changes in water yield or stream flow would occur beyond existing condition. Current erosion problems on Forest Service roads would continue to occur. Improving the subwatershed conditions through road decommissioning would not occur. Part of the road decommissioning proposed to convert a few roads to trails. This alternative would not convert certain roads to a system trail. No changes to the areas resiliency against the effects of wildfire, drought, disease and other disturbances would occur since none of the treatments would be implemented. Cumulative effects would remain the same as listed within Affected Environment section of this report and displayed again in Table 47 below.

Table 47. Alternative 1 ERA's and Percent TOC Results per Subwatershed

Subwatershed	Subwatershed Name	ERA's Available	ERA's Used to Date	ERA's Remaining	Percent TOC
9CK	South Fork Ant Canyon	35.00	0.00	35.00	0.00
9CM	Unnamed	45.28	0.00	45.28	0.00
9CO	Stormy Canyon	89.25	0.09	89.16	0.10
9DA	Dry Meadow Creek	61.14	37.32	23.82	61.04
9DB	Tyler Meadow Creek	42.99	30.63	12.36	71.25
9DC	Shultz Creek	46.16	2.32	43.84	5.02
9DD	Deep Creek	87.28	6.82	80.46	7.81
9DE	Girl Scout Camp	54.24	3.99	50.25	7.36
9DJ	Baker Creek	21.00	5.00	16.00	23.82
9DL	Bull Run	28.77	4.59	24.18	15.97
9DM	South Bull Run Creek	42.48	1.62	40.86	3.81
9DN	Unnamed	35.64	0.10	35.54	0.27

Alternative 2 - Proposed Action

Alternative 2 proposes to thin forest stands in the project area to restore a healthy, diverse, fire resistant forest structure. Vegetation treatments would reduce densities, reduce fuel loads, and modify species composition. Vegetation treatments consist of both commercial and non-commercial activities. Commercial activities include tractor (ground-based) skidding, temporary road construction, creating and reusing existing landings, skid trails, and skyline yarding on the existing road system as well as on some temporary roads created for the project. Non-commercial activities consist of hand thinning vegetation, prescribed burns, mastication, shaded fuel break creation, and road decommissioning.

Some of these treatments have similar effects on hydrologic resources, but at varying degrees. Further analysis of each treatment, both commercial and non-commercial, can be read below.

Commercial Treatments

Tractor skidding would be ground based machines. Feller bunchers or harvesters would be used on short steep slopes to cut and place trees onto 35 percent or less slopes for skidding equipment to transport to landings. Incidental use of this equipment above 35% may occur. However, use above 35% should be for safety and/or minimizing effects on natural resources. An example would be for directional felling and winching techniques. These techniques would be used on slopes above 35% in order to fall trees to lower slopes where the tractors to operate on. Tractors would generally remain within 1200 feet distance to landings. These activities would remove vegetation and decrease ground cover. Decrease ground cover could cause accelerated erosion during precipitation events. The extra sediment generated from the accelerated erosion process could deposit into nearby channels and effect water quality. However, established RCAs, SMZs, and selected BMPs would mitigate this potential effect (see section *Law, Regulation, and Policy Applicable to Hydrology* in the Hydrology Report for more details). These two land allocations, RCAs and SMZs, would minimize the chances of accelerated erosion and deposition into nearby channels. BMPs would be sufficient to control nonpoint source pollution during and following these treatments (Lynch et al. 1985 and Norris, 1993). Mechanical use (excluding chainsaws) is only allowed in the RCA and SMZ for hazard tree removal.

Temporary road construction is needed for use by yarding equipment to collect and haul timber proposed for removal. Construction would not occur on side slopes greater than 30%. This type of activity removes vegetation, decreases ground cover, and displaces soil. The amount of bare soil exposed is greater than tractor skidding, thus having a higher potential for accelerated erosion from precipitation events. Roads, both permanent and temporary, can have the greatest effect on erosion (Megahan, 2004) and can be the dominant source of sediment (Brown and MacDonald, 2005). Although there are concerns for increased sediment and erosion, procedures are in place to reduce the likelihood of erosion and sediment. These procedures include closing and restoring the surface by scarifying the road surface. Drainage features would be restored, woody debris placed on the road bed, planting if needed to re-establish vegetative cover, and barriers placed to prevent off-highway vehicle use. Additionally, BMPs would be used to further reduce the chances of erosion and generating nonpoint source pollution.

Landings created and reused would result in decreased cover and displaced and compacted soils. Pooling water could collect from precipitation and potentially create excess erosion within and adjacent to the landing. Deposition of this excess erosion in the form of sediment could be deposited along the landscape and potentially continue down the hillside to a nearby stream channels. In order to minimize this possibility from occurring, landings would be rehabilitated after operations are complete. Incidental slash and woody debris left on landings would be scattered to restore soil organic cover as part of landing restoration. This would decrease the chances of excess erosion. Any areas of the landing deemed compacted would be ripped/scarified and seeded to restore the functionality of the soil and promote re-establishment of vegetation. BMPs would further mitigate sediment concerns.

Skid trails would be created as a result of tractor skidding downed trees along the landscape. The skidding displaces ground cover on varying degrees of slope. The displaced ground cover can expose bare soil. Bare soil exposed to precipitation events can create accelerated erosion in the forms of gullies or rills. In turn this can transport the excess sediment generated into nearby stream channels. In order to minimize the effects of precipitation on bare soil, a mitigation of restoring ground cover would be used. This could include, but not limited to, scattering slash and returning displaced organic matter along the skid trail. BMPs would additionally be used to further mitigate and alleviate any erosion/sediment concerns.

Skyline yarding would occur on slopes of 35% or greater. Existing and temporary roads would be utilized for the skyline yarding process. It is expected that minimal amounts of disturbance would occur to the ground cover when compared to tractor skidding. Fallen trees would be transported on a suspended cable and not skidded along the ground. Concerns are the same as tractor skidding regarding ground cover loss and displacement of soil, but at a smaller scale. Mitigations used would be the same as tractor skidding.

All the above commercial activities could affect water-yield. Vegetation removal, particularly tree removal, can increase water-yield, which can shorten the duration of stream flow, but increase the intensity. Increased flows could increase channel erosion. However, 20% of the basal area needs to be removed in order for “statistically significant change” to occur (Elliot, et al., 2010). The proposed units within the Tobias Project are not going to remove 20% or more of the basal area. Along with RCAs, SMZs, and BMPs, minimal to no change in water-yield and stream flows are expected.

Non-commercial Treatments

Hand thinning would consist of removing vegetation 10-inches in diameter or less by hand crews. Additionally hand thinning would be used on slopes greater than 35% when mechanical equipment cannot be used. Removal of vegetation can expose bare soil. If bare soil is exposed to precipitation, accelerated erosion could occur in the form of gullies or rills. This process can generate excess sediment that could be transported to nearby stream channels. However, hand treatments, such as thinning, are expected to produce minimal changes to ground cover. Changes in ground cover would be localized to the spot in which the vegetation was removed. Vegetation would be collected and piled by hand, further reducing ground cover displacement. Furthermore BMPs would be used to further mitigate any potential for excess sediment and accelerated erosion concerns.

The use of prescribed fire is a treatment proposed in this alternative. Both mechanical and hand treatments would be used for pile burning, lop and scatter, chipping, mastication, and hand thinning. Prescribed fire would include understory burning. Using prescribed fire as a treatment can affect hydrologic resources in several ways by potentially causing excessive removal of vegetation and ground cover creating a range of burn severity. The degree of burn severity can result in accelerated erosion, stream instability, sediment transport and deposition into stream channels, changes in water-yield, and changes in stream flow[9]. However, prescribed fire is designed to burn at low severity. Low burn severity, as stated earlier from Robichaud and Heard, will have a minimal to no effect on hydrologic resources. *Project Design Features for RCAs and SMZs* along with BMPs would further minimize the likelihood of prescribed fire effects on hydrologic resources.

Mastication is a treatment that removes vertical vegetation by grinding it with a tractor mounted masticator and is displaced horizontally or along the forest floor. Masticating would occur on slopes up to 35% and slash generated will be left on the ground. This type of treatment would be used in place of hand thinning. The effects of masticating regarding hydrologic resources are soil disturbance and changes in ground cover. Soil disturbance can be created due to the machine moving and turning along the landscape. However, this can be minimized by using a boom-mounted cutting head, using low-ground-pressure equipment or limit equipment to designated trails, and operate when soils are dry (Busse, et. al., 2014). A study on mastication followed thinning of mixed-conifer forest in the Sierra Nevada and found it did not increase the extent of detrimental compaction in heavily managed stands

[9] As mentioned in the *Potential Concerns for Hydrologic Resources* section

using a 31-kPa (4.5-psi) masticator (Moghaddas and Stephens, 2008). Changes in ground cover are similar to soil disturbances.

Mastication could change the amount of ground cover as the machines moves along the landscape. It is possible the tracks can displace the existing forest floor and expose bare soil. However, masticating generates ground cover during its operation. Vertical vegetation is ground down and placed on the forest floor. The amount of vegetation placed on the forest floor varies up to 24 cm in depth (Busse et al., 2005), but typically from 3 to 7 cm (Busse et al, 2014). This would cover any potential for exposed soil and increased runoff/erosion from precipitation events. BMPs associated with mastication would be used to further mitigate the potential for excess erosion. Depending on conditions found during project implementation, mastication may be used for shaded fuel breaks.

Fuels reduction would completely remove vegetation with a 10-inch diameter and less by either mechanical or hand thinning. All piles of slash would be piled and burned or removed from the fuel break. Concerns regarding hydrologic resources are burn severity from pile burning, decreased ground cover, and increase potential for erosion due to exposed bare soil. However, these concerns are alleviated as burn severity would be localized to piles created and it is designed to be low severity (as stated previously). Vegetation removed would be brush and small trees. Vegetation along the edges of the fuel break would provide adequate ground cover and act as a filter and flow displacer should any accelerated erosion occur. BMPs would further mitigate and alleviate concerns associated with shaded fuel break construction.

Road maintenance, closure, and/or decommissioning would be beneficial to the subwatersheds within the Tobias Project. Roads can have the greatest effect on erosion (Megahan, 2004) and can be the dominant source of sediment (Brown and MacDonald, 2005). The lack of maintenance on Forest Service roads can be observed by rills, gullies, and other erosive features (see engineering report). Roads used in the project area would be maintained to standard, which would reduce accelerated erosion. Some of the roads used within the project would be decommissioned prior to project completion.

Several Forest Service roads are selected for decommissioning (see engineering report or the *Best Management Practices* section, BMP 2.7). Concerns for hydrologic resources during road decommissioning are associated with sediment. Decommissioning a road typically causes a spike in sediment production (Robichaud, et. al, 2010) which can be transported to a nearby stream during runoff. However, the spike decreases rapidly after the activity ends (Robichaud, et. al., 2010) and therefore is short term. The long term benefits are improvements to water quality by reducing erosion and deposition into streams. BMPs applicable for road decommission would be used to minimize the potential for negative short term effects on hydrologic resources.

Sediment production as a result of decommissioning can enter a channel faster due to proximity and amount of runoff. This is especially true when culverts are removed from a stream crossing. However, this is short term and the additional sediment decreases by an order of magnitude within two hours (Foltz and Yanosek, 2005; Robichaud, et. al., 2010). The long term benefit of no longer having these roads actively depositing sediment into riparian areas and stream channels outweighs the short term increases in sediment generated by decommissioning. BMPs would be implemented to further minimize any potential negative effects at stream crossing locations. Decommissioning would occur during the fall, when stream flows are at their lowest to further minimize sediment transport.

Sunday Peak Trail (31E66), Bull Run Trail (32E39), Portuguese Trail (31E59), and Baker Point Trail (32E37) may need trail maintenance during and after project implementation. Trail maintenance would occur if management activities impact the trail corridor. For example, while skidding logs the machine scrapes or compromises the integrity of the trail bed. If the trail is left damaged, future precipitation events could wash or gully out the trail causing erosion issues. Trail maintenance would be completed following management activities, but before a known storm, to insure integrity and reduction of erosion along the trail bed and corridor. BMPs would be used to mitigate erosion concerns during trail maintenance activities.

Cumulative Watershed Effects Analysis for Alternative 2

Past and present activities within the project area are included in the Cumulative Watershed Effects (CWE) analysis. These activities, as discussed previously in the affected environment section, are captured in the Sequoia National Forest's Cumulative Watershed Effects (CWE) model. These activities along with the proposed activities of Alternative 2 are analyzed to determine the threshold of concern per subwatershed. The analysis also assumes all management activities would be completed within 1 year. The assumption is rather ambitious but presents a "worst case scenario" regarding thresholds for the watershed. Alternative 2 would likely be implemented beyond a year, which would produce an increase in recovery time for the subwatershed and decreases ERAs used. This means the threshold of concern would not be as high as shown in table 37 below.

The CWE Analysis concludes subwatersheds impacted by the proposed management activities, as described in Alternative 2, are not at nor exceed 100% threshold of concern. One subwatershed, Tyler Meadow Creek (9DB) is above 80% threshold. This requires the Sequoia National Forest to "perform an on-site review to determine the actual recovery rates and to evaluate the effects of the proposed project" and "where field verification is impossible, the Forest may assume a thirty year recovery rate" (Mediated Settlement Agreement, 1990). Recovery rates are set at 30 years for management activities. Prescribed fire and wildfire rates are set to 5 years based on research within the Sequoia National Forest by Bergs and Azuma in 2008. Effects of the proposed project are analyzed and discussed below.

Thresholds of Concern for all subwatersheds under Alternative 2 range from 0.00% to approximately 93.28%. Alternative 2 has the highest increase in TOC when compared to Alternative 3 (see Effect of Each Alternative; Alternatives 3). This is due to the types of treatments proposed in Alternative 2, specifically harvesting with tractors and skylines. Table 48 displays the results of Alternative 2 compared to existing conditions.

Table 48. Alternative 2 comparison with existing condition

Subwatershed	Subwatershed Name	ERAs Available	Alternative 1 ERAs Used	Alternative 2 ERAs Used	Alternative 2 ERAs Remaining	Alternative 2 Percent TOC
9CK	South Fork Ant Canyon	35.00	0.00	0.01	34.99	0.02
9CM	Unnamed	45.28	0.00	0.00	45.28	0.00
9CO	Stormy Canyon	89.25	0.09	0.10	89.15	0.11
9DA	Dry Meadow Creek	61.14	37.32	46.82	14.32	76.57
9DB	Tyler Meadow Creek	42.99	30.63	40.10	2.89	93.28
9DC	Shultz Creek	46.16	2.32	5.70	40.46	12.35
9DD	Deep Creek	87.28	6.82	15.50	71.78	17.76
9DE	Girl Scout Camp	54.24	3.99	5.56	48.68	10.25
9DJ	Baker Creek	21.00	5.00	7.23	13.77	34.40

9DL	Bull Run	28.77	4.59	4.96	23.81	17.24
9DM	South Bull Run Creek	42.48	1.62	1.64	40.84	3.85
9DN	Unnamed	35.64	0.10	0.10	35.54	0.27

Analysis of potential effects to hydrologic resources indicates Alternative 2 could result in short term disturbances, but long term gain. It is unlikely that increased erosion and water-yield would affect aquatic and soil resources over the long term. Potential long term benefits resulting from treatment could reduce wildfire potential for a high burn severity wildfire, reduce the erosion along Forest Service roads, and reduce excess sediment from entering riparian areas. Threshold levels per subwatershed are the highest when compared to the other alternatives (1 and 3). Overall Alternative 2 would be beneficial for hydrologic resources because proposed management actions do not exceed subwatershed thresholds levels.

Cumulative Watershed Effects Analysis for Alternative 3

CWE for alternative 3 includes all the management activities of Alternative 2 minus the commercial treatments. Thresholds of Concern for all subwatersheds under Alternative 3 range from 0.00% to approximately 86.74%. Alternative 3 has the lowest increase in TOC when compared to Alternative 2 (see Effect of Each Alternative; Alternatives 2). This is primarily due to excluding the commercial treatments and replacing them with non-commercial treatment. Table 38 displays the results of Alternative 3 compared to existing conditions.

Alternative 3

Alternative 3 contains the same number of treated acres as Alternative 2, but with no commercial treatments. All acres would be done by hand and with prescribed fire. No commercial products for removal would be permitted except for personal firewood. Mitigations for commercial treatments would not apply in Alternative 3. Increasing the number of acres treated by hand and prescribed fire would have the same concerns and mitigations applied to those areas as discussed in the Alternative 2 non-commercial treatments section. Road maintenance and decommissioning would still occur under Alternative 3 and the effects of these actions are the same as those discussed previously in Alternative 2.

Table 49. Alternative 3 comparison with existing condition

Subwatershed	Subwatershed Name	ERAs Available	Alternative 1 ERAs Used	Alternative 3 ERAs Used	Alternative 3 ERAs Remaining	Alternative 3 Percent TOC
9CK	South Fork Ant Canyon	35.00	0.00	0.01	34.99	0.02
9CM	Unnamed	45.28	0.00	0.00	45.28	0.00
9CO	Stormy Canyon	89.25	0.09	0.10	89.15	0.11
9DA	Dry Meadow Creek	61.14	37.32	44.28	16.86	72.43
9DB	Tyler Meadow Creek	42.99	30.63	37.29	5.70	86.74
9DC	Shultz Creek	46.16	2.32	5.62	40.54	12.18
9DD	Deep Creek	87.28	6.82	12.41	74.87	14.22
9DE	Girl Scout Camp	54.24	3.99	4.61	49.63	8.50

9DJ	Baker Creek	21.00	5.00	6.19	14.81	29.46
9DL	Bull Run	28.77	4.59	4.96	23.81	17.24
9DM	South Bull Run Creek	42.48	1.62	1.64	40.84	3.85
9DN	Unnamed	35.64	0.10	0.10	35.54	0.27

Analysis of potential effects to aquatic resources indicates Alternative 3 could result in short term disturbances to hydrologic resources such as erosion. It is unlikely that short term increases in erosion and water-yield would affect aquatic and soil resources over the long term. Potential long term benefits resulting from treatment could reduce wildfire potential for a high burn severity wildfire, which could reduce potential for increased erosion and deposition into riparian areas and stream channels. Alternative 3 reduces the potential for wildfire which reduces potential for cumulative watershed effects resulting from future wildfire. This alternative would be the best for hydrologic resources because proposed management activities do not exceed subwatershed thresholds levels and the thresholds are lower than Alternative 2.

Summary of Alternatives for Hydrologic Resources

Table 50 summarizes the alternatives by ranking each of them with a quick one word summary regarding the benefits to hydrologic resources, increases in percent threshold of concern (TOC), and how many subwatersheds are over the TOC per alternative. Table 39 was designed as a quick reference for decision making. Table 51 that follows it displays a comparison of all alternative threshold of concern percentages side by side.

Table 50. Summary of Alternatives in Simple Terms

	Benefits to Hydrologic Resources	Increase in TOC %	Subwatersheds Over TOC?	Subwatersheds Over 90% TOC?
Alternative 3	Best	Least	No	No
Alternative 2	Good	Most	No	Yes
Alternative 1	None	None	No	No

Table 51. Alternatives comparison "side-by-side" regarding threshold of concern (TOC)

Subwatershed	Subwatershed Name	Alternative 1 Percentage TOC	Alternative 2 Percentage TOC	Alternative 3 Percentage TOC
9CK	South Fork Ant Canyon	0.00	0.02	0.02
9CM	Unnamed	0.00	0.00	0.00
9CO	Stormy Canyon	0.10	0.11	0.11
9DA	Dry Meadow Creek	61.04	76.57	72.43
9DB	Tyler Meadow Creek	71.25	93.28	86.74
9DC	Shultz Creek	5.02	12.35	12.18
9DD	Deep Creek	7.81	17.76	14.22
9DE	Girl Scout Camp	7.36	10.25	8.50
9DJ	Baker Creek	23.82	34.40	29.46
9DL	Bull Run	15.97	17.24	17.24

9DM	South Bull Run Creek	3.81	3.85	3.85
9DN	Unnamed	0.27	0.27	0.27

Law, Regulation, and Policy applicable to Hydrology

Laws, regulation and policy applicable to managing soil and water quality include the Clean Water Act and Sierra Nevada Forest Plan Amendment (SNFPA) 2004. Applicable management requirements and constraints provided by the SNFPA are:

- ☒Aquatic Management Strategy (AMS) goals and objectives
- ☒Riparian Conservation Areas
- ☒Riparian Conservation Objectives (RCO) Analysis standards and guidelines
- ☐Critical Aquatic Refuges
- ☐Long-term strategy for anadromous fish-producing watersheds

Critical Aquatic Refuges does not apply because the project is not located inside a designated Critical Aquatic Refuge. Long-term strategy for anadromous fish-producing watersheds applies only to the Lassen National Forest and is therefore not applicable to this project area.

Riparian Conservation Objectives Analysis

The RCOs listed in the Sierra Nevada Forest Plan Amendment 2004 was reviewed for applicability to the project. All RCOs apply to the Tobias Project. Each RCO listed has a brief overall objective to achieve when completing the RCO analysis.

☒ RCO 1. Ensure that identified beneficial uses for the water body are adequately protected. Identify the specific beneficial uses for the project area, water quality goals from the Regional Basin Plan, and the manner in which the standards and guidelines will protect the beneficial uses.

☒ RCO 2. Maintain or restore: (1) the geomorphic and biological characteristics of special aquatic feature, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; (2) streams, including in stream flows; (3)hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species.

☒ RCO 3. Ensure a renewable supply of large down logs that: (1) can reach the stream channel and (2) provide suitable habitat within and adjacent to the RCA.

☒ RCO 4. Ensure that management activities, including fuels reduction actions, within RCAs and CARs enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species.

☒ RCO 5. Preserve, restore, or enhance special aquatic features, such as meadows, lakes, ponds, bogs, fens and wetlands, to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas.

☒ RCO 6. Identify and implement restoration actions to maintain, restore or enhance water quality and maintain, restore, or enhance habitat for riparian and aquatic species.

Each RCO listed above contains several guidelines. These guidelines may or may not apply to the project being proposed. Those that apply to the project insure management activities are meeting the overall Riparian Conservation Objective and, ultimately, the Aquatic Management Strategy. The Tobias Project meets all the Riparian Conservations Objectives applicable to the project and further detailed analysis can be read in Appendix B of the Hydrology Report.

Potential Concerns for Hydrologic Resources

Potential concerns associated with the proposed treatments are high burn severity, accelerated erosion, deposition, sediment transport, stream stability, changes in water-yield, and stream flow. These concerns are explained in further detail below. Analysis of each treatment used in the Tobias project and their relation to the concerns are discussed in the *Effects of Alternatives* section.

High Burn Severity

A concentration of fuels increases the likelihood of high severity wildfires. High severity wildfires reduce vegetative cover, both along the landscape and riparian areas, and increase the potential for accelerated erosion. Accelerated erosion from post-fire precipitation events could potentially deposit sediment into nearby channels, decreasing aquatic habitat, and changing the stream channel's geomorphology. Loss of vegetative exposes the stream channel to higher temperatures, which could decrease dissolved oxygen and affect aquatic habitat.

High burn severity wildfires can cause both short and long term impacts to hydrologic resources. By allowing prescribed fire and timber harvesting actions proposed by Tobias project, these treatments could reduce future impacts to hydrologic resources from wildfires. However, allowing the vegetation to increase in density and concentration could have an opposite effect.

Increasing the chances for high severity wildfires by having dense vegetation causes concerns for hydrologic resources because of the adverse effects on water quality and habitat (Keane and others, 2002). Studies on post wildfires with high burn severity have documented the impacts to hydrological resources. Robichaud and others discovered that:

> The effects of high severity wildfires on runoff and erosion are generally much more severe than the effects of prescribed fires. High severity fires are of particular concern because of the loss of protective cover and fire-induced soil water repellency can induce severe flooding and erosion even after moderate rain events (DeBano and others 1998; Neary and others 2005). In severely burned areas, high intensity, short duration rain events have increased peak flows from 2 to 2,000 times (DeBano and others 1998; Neary and others 1999, 2005). Published sediment yields after high severity wildfires range from 0.004 to 49 t ac_{-1} yr_{-1} (0.01 to over 110 Mg ha_{-1} yr_{-1}) in the first year after burning (Benavides-Solorio and MacDonald 2005; Moody and Martin 2001; Robichaud and others 2000).

In order to minimize these potential impacts, wildfires or prescribed fires need to burn at a lower severity. Prescribed fire burn at low severity minimizing the likelihood of increased peak flows and erosions rates (Robichaud et. al. 2010). As long as prescribed fire is able to burn at low severity, concerns for hydrologic resources would be alleviated.

Accelerated Erosion from Vegetation Removal

Vegetation removal, from prescribed fire, thinning, and timber harvesting, could potentially allow for accelerated erosion due to an increase in exposed soil. Precipitation and/or snow melt events could create gullies, rills, and/or surface sheet flow across the un-vegetated and exposed soil. If enough exposed soil experiences accelerated erosion, the possibility for sediment entering a nearby channel is more likely.

Deposition, Sediment Transport, and Stream Stability

Sediment deposition into stream channels as a result of the proposed management activities (i.e. prescribed fire, timber harvesting, and road maintenance) could affect channel morphology, specifically width/depth ratio (wider but shallower stream). High width/depth ratio stream channels are typically associated with increased water temperature, decreased dissolved oxygen, and loss of aquatic resources (Rosgen, 1996). Sedimentation potentially causes a decrease in velocity and stream power[10] which decreases the potential for the channel to transport sediment. This has the potential to reduce stream channel stability by filling pools. Additionally, deposition is often associated with stream bank erosion which further provides a source for sediment (Rosgen, 1996).

Changes to Water-yield and Stream Flow

Prescribed fire has the potential to reduce the soil water storage capacity by removing forest litter, which adds the potential for increased water-yield. Increases in water-yield may shorten the duration of stream flow, but increase the intensity. Increased intensity of stream flow can increase stream power, velocity, and sheer stress, which could increase erosion of the stream channel. However, these changes to stream flow are a result of high burn severity. Prescribed fire operations typically burn at low severity. A study within the Sequoia National Park evaluated the effects of low burn severity in Giant Sequoia groves. The study discovered the project had no effect on stream flow after burning 12,000 acres (Heard, 2005).

Timber harvesting activities have the potential to increase water-yield and stream flows similar to prescribed fire. Water-yield and stream flow can be temporarily altered when enough ground cover has been removed. Harvesting removes vegetation, particularly trees, which can decrease ground cover, expose bare soil, and potentially increase runoff response to nearby stream channels. Research from the Rocky Mountain Research Station states,

> "Data from 95 watershed experiments conducted in the United States show that, on average, annual runoff increases by nearly 2.5 mm for each 1 percent of watershed area harvested (Stednick 1996). Because runoff is quite variable from year to year, the general conclusion is that approximately 20 percent of the basal area of the vegetation must be removed before a statistically significant change in annual runoff can be detected (Bosch and Hewlett 1982; Hibbert 1967; Stednick 1996)" (Elliot, et. al., 2010).

A summary of the paragraph as it relates to the project can be understood this way. The Tobias Project would have to "clear cut" approximately 20% of a stand or greater to notice a change. As long as any stand doesn't remove 20% of the basal area, increases in water-yield and stream flow would not occur at a statistically significant level.

Wildlife

Environmental Consequences

Environmental Consequences of the Project Alternatives on Wildlife

All alternatives were evaluated in the context of the activities proposed and their influence on chosen indicators. Analysis indicators were identified for each species to evaluate habitat availability (acres), or unique stand elements important to the species and thereby compare the effects of the different project alternatives. In addition each alternative was also evaluated with modeled wildfire post treatment.

The Forest Vegetation Simulator (FVS) and fire and fuels extension were used to model vegetation changes based on each alternative and with the modeled wildfire. Points of

[10] Stream power is the average rate of kinetic energy supplied and dissipated along a stream channel.

comparison in time between alternatives considered include the following: 1). Existing condition 2014; 2). Alternative 1 (No Action) 2024 and Action Alternatives (2 and 3) with treatment reflected in 2024; and 3). Alternative 1 (no treatment) with a modeled wildfire reflected in 2034, and Action Alternatives (2 and 3) with treatment followed by a modeled wildfire reflected in 2034.

ENDANGERED, THREATENED, AND PROPOSED SPECIES:

California Condor

Analysis Indicators

The project area could provide potential roosting habitat where it overlaps with the Glennville/Woody essential habitat as denoted by the USFWS. As previously stated essential habitat encompasses specific areas where historic use occurred and that may be used to supplement critical habitat at some future date. Therefore this analysis evaluates whether actions would foreclose options for its continued use in the future in respect to the indicators chosen. Analysis indicators used to evaluate project effects on the condor and its roosting habitat include the following:

Indicator 1: Increased levels of disturbance within potential roosting habitat or known roost areas identified within the forest plan.

Some early reported observations of roosting condors note that increased noise levels and motion may negatively influence selection of roost sites or normal use of these features for some period of time (Koford (1953). Forest thinning, mastication, fuel reduction activities, and temporary road work utilizing mechanical equipment increasing noise levels and human activity (access, movement).

Indicator 2: Changes in the availability and distribution of roost structures specifically large snags and live trees (≥24 inches diameter):

Condors select roost sites on the upper two-thirds of steep slopes where there is a long unobstructed space for downhill flight. Retaining a series of large roosting structures (large snags or large live trees) across the landscape is important for the condor.

Direct and Indirect Effects

The evaluation of direct and indirect effects is specific to proposed actions that would occur within essential condor habitat and the acres affected. Several Tables and Figures presented provide information for all of the Alternatives.

Indicator 1: Increased levels of disturbance within known roost areas identified within the forest plan, or other potential roosting habitat.

Alternative 1 (No Action) - With a selection of the No Action Alternative the Tobias Project would not be implemented (Table 52). Ambient disturbance associated with normal vehicle traffic and travel on 24 miles of existing roadway (ML 2-5) (Table 53) and ongoing recreation use within essential habitat in the project area would continue. No new temporary roads or reconstruction of existing temporary roads would occur. Based on historical and contemporary observations of condor activity on the Forest, incidental or transient use would continue at current levels.

Alternative 2 and Alternative 3 – Disturbance related effects would be limited to the acres treated under Alternatives 2 and 3. Of the 122,360 acres of essential condor habitat that occurs on Forest Service lands, Action Alternatives would treat the same estimated 2,904 acres with each Alternative but use different treatment activities (Table 52). Treated ground regardless of alternative would represent approximately 2% of the total essential habitat available to the condor on Forest Service lands.

Table 52. Treatment Acres in Condor Essential Habitat by Alternative in the Tobias Project Area.

Treatment Activity	Alt. 1	Alt. 2	Alt. 3
Commercial thin	0	938	0
Hand Thinning of small trees < 10" dbh and brush	0	739	1,136
Mastication of small trees <10" dbh and brush	0	844	1,385
Prescribed Understory burning	0	383	383
Total Acres	0	2,904	2,904

Alternative 2 would differs from Alternative 1 in that it would allow approximately 3.5 miles of new temporary road construction and reconstruct approximately 2.0 miles of existing temporary road as needed for project implementation (duration 3-5 years)(Table 53). These roads however would be closed and rehabilitated after use. In contrast, Alternatives 1 and 3 would have no new temporary road construction or reconstruction (Table 53). Both Action Alternatives also decommission approximately 2.2 miles of existing FS system roads (24815A, 24824A, 24825A, 24834A, 24846A) in essential habitat.

Table 53. Miles of new temporary road construction, temporary road reconstruction, road decommissioning, and total miles of existing FS roads in condor essential habitat overlapping the Tobias Project pre (Alt. 1) and post implementation (Alt. 2 and 3).

Road Type	**Alt. 1**	**Alt. 2**	**Alt. 3**
Miles of new temporary road construction	0	3.5	0
Miles of existing temporary road that would be reconstruction	0	2.0	0
Miles of existing FS system roads proposed for decommissioning	0	2.2	2.2
Total Miles of road pre (Alt. 1) and post project (Alt. 2 and 3)	24.3	22.1	22.1

The Tobias Project represents a relatively small percentage of the condor's essential habitat located on its eastern fringe. Historic roost data reviewed showed limited activity has occurred in the project vicinity. Review of flight/roost data made available to us from the USFWS showed no roosting locations in the Tobias Project Area in 2014 and 2015.

It is possible that should a condor roost in the project area when activities occur, it could cause the condor to flush from it roost and to leave the area. However, these factors are not considered detrimental to the condor (Pers. Com S. Kirkland, Condor Recovery Team, 2015). Disturbances such as those possible were found to present limited ability to constrain the condor's activity. The condor is a long range flyer capable of moving substantial distances within their range in a day, and therefore disturbance as it relates to a roosting context presents little negative consequence (Pers. Com. S. Strickland and J. Brandt, California Condor Recovery Team, July 2015).

Other condor roost sites used with sufficient frequency to define them as historic roost areas as noted within the Forest Plan do not occur within the Tobias Project boundary. All are located on the west slope of the Greenhorn Mountains. The two closest sites include Basket Pass located approximately 6 air miles southwest of the project area, and Lion Ridge located approximately 3 air miles to the northwest of the project. These popular roost sites continue to be used when condors are present on the Forest because they provide suitable conditions and access to the condor's traditional foraging grounds (Critical Habitats 8 and 9).

The USFWS recommends that activities within ½-mile of roost sites should be reviewed and considered for road closure. Given the distances of the previously discussed roost areas in relation to the Tobias Project location, it is unlikely that any increases in disturbance relevant to project implementation would result in changes in their use.

Forest Service will monitor the condor satellite tracking website for condor activity during harvest and fuel reduction activities. Should condor activity or an ocular report suggest active use of a roost site in the Project area, design features would implement a Limited Operating Period (LOP) for treatment activities within ½ mile of the roost location.

Indicator 2: Alteration of roosting habitat quality - Changes in the availability and distribution of large snags and live trees (≥24 inches diameter).

Alternative 1 (No Action) - Under the No Action Alternative, no forest thinning or other fuels treatment work would occur; therefore no large changes in roosting habitat quality would be expected. Estimated large snag and large live tree density would gradually increase over the next 50 years as noted through FVS modeling and displayed in Figures 35 and 36. The weighted average for all modeled CWHR forest types suggest snag levels would increase from approximately 2.0 snags (≥ 24" dbh) per acre in 2014 to approximately 8.0 snags per acre by the end of the modeled cycle (2064)(Figure 35). The weighted average of large live trees (≥24" dbh) would also gradually increase from approximately 30 trees per acre in 2014 to approximately 45 trees per acre by 2064 (Figure 36). Past informal consultation with the USFWS for the condor has stipulated the need to retain a minimum of 2-3 large (≥24" dbh), snags or live trees per acre to provide for roosting purposes. Therefore, existing levels of these attributes are currently available to fulfill the needs of the condor.

Given a modeled wildfire under 90th percentile weather conditions with results displayed in 2034, significant mortality would be expected to occur in forested stands without prior thinning and associated fuels treatment. Snag levels in trees ≥ 24" dbh were estimated to increase to approximately16 snags per acre, and then slowly decrease over the next three decades to approximately 12 snags per acre by 2064 (Figure 35). The availability of large live trees would decrease from an estimated 40 trees per acre to approximately 22 trees per acre under the No Action Alternative with wildfire (2034)(Figure 36).

These outcomes are tentative and dependent on weather conditions, fire suppression resources available, and the scale and rate of spread of any fire event. If the fire can be contained within the project area a localized decrease in habitat quality would be anticipated on 2% of essential condor habitat present in the analysis area; however, if it were to be able to cross the ridge onto the west slope of the Greenhorn Mountains greater losses in roosting habitat quality could be realized.

Figure 35. Weighted Average Snags ≥ 24" dbh per Acre for all Modeled Forest CWHR Types in Suitable California Condor Habitats in the Tobias Project Area by Alternative (2024) and with Modeled Wildfire (2034)

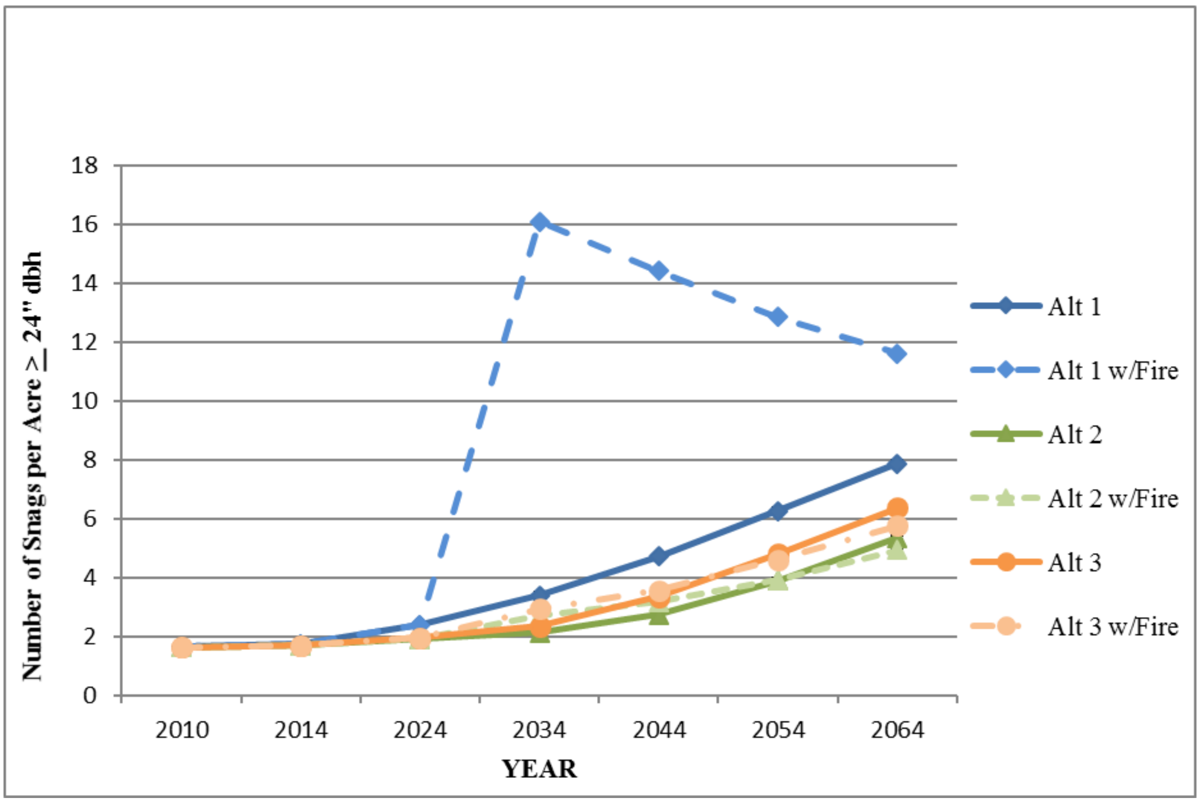
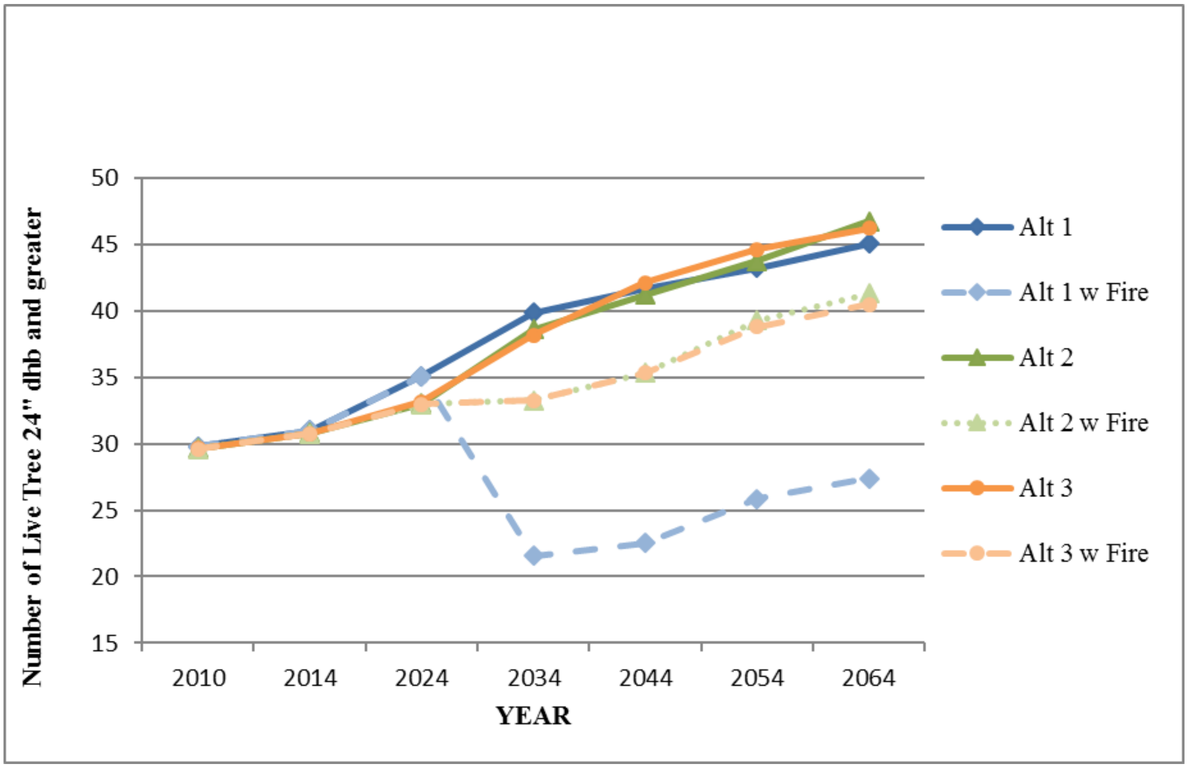


Figure 36. Weighted Average Live Trees ≥ 24" dbh per Acre for all Modeled CWHR Forest Types in Suitable Condor Habitat in the Tobias Project Area by Alternative (2024) with Modeled Wildfire reflected in 2034



Alternative 2 - Implementation of Alternative 2 would allow commercial thinning on 964 acres, thinning of small trees (<10" dbh) and brush on 1,583 acres, prescribed understory burning on 383 acres, temporary road construction and reconstruction on a total of 4.2 miles, and decommissioning of 2.2 miles of FS roadway in essential condor habitat. FVS modeling of conditions post treatment show the snag trend line for this alternative would remain relatively static (2 snags per acre) until 2034, increasing gradually to approximately 5 snags per acre by 2064 (Figure 35). The slightly lower snag values generated through modeling with Alternative 2 are a result of decreased stand density and competition between trees, which have an overall effect to lower tree mortality as a result of thinning. This modeling, as previously stated, does not reflect snag recruitment through stochastic events such as the current drought cycle which has likely increased snag density based on ocular reviews. Regardless, values are anticipated to remain within the natural range of variability expected for large snags of 2-4 snags per acre, typical of the Sierra Nevada.

In respect to large live tree density, the trend line for this alternative shows a slightly lower but increasing curve which intersects with that of the No Action by 2044 and slightly exceeding it by 2064 (Figure 36). Therefore proposed thinning and fuel reduction actions under this alternative are anticipated to have a limited effect on the overall availability of large live trees or snags (≥24" dbh). In addition, the 2004 SNFPA stipulates that all trees 30" and greater would be retained, unless deemed an immediate safety hazard. This measure will insure that the majority of largest size class of live trees and snags would be retained across the landscape and available for continued condor use. An adequate recruitment pool of young and medium size class trees would remain in stands to promote a series of mature replacement trees in the future.

Expected large snag and large live tree densities post treatment followed by a modeled wildfire (2034) are displayed in Figures 35 and 36. Implementation of Alternative 2 with a subsequent wildfire shows that snag availability would increase only slightly as a result of wildfire in contrast to Alternative 1 where high tree mortality from a fire event is predicted. The data also suggests that a greater percentage of large live trees within treated stands would be retained given a wildfire scenario with Alternative 2. The highest loss of large live trees would occur in a selection the No Action Alternative with wildfire. The number of large live tree retained with a selection of Alternative 2 with treatment only, are initially lower than that noted with Alternative 1. However, FVS modeling suggests that this marginal trade-off over the short term is predicted to retain a greater percentage of large live trees given a wildfire scenario (See Alt. 1, 2034). Therefore, implementation of Alternative 2 is expected to improve overall stand resiliency, and stability in retaining large live trees over time, in contrast to that of Alternative 1. A selection of Alternative 2 would maintain roosting habitat quality in a useable condition for the condor for both attributes through all timed phases.

Alternative 3 - Implementation of Alternative 3 would allow hand and mechanical thinning of only small trees (<10” dbh) and brush on 2,521 acres, prescribed understory burning on 383 acres, and 2.2 miles of Forest Service road decommissioning within essential habitat. FVS modeling of conditions post treatment show a snag trend line that would remain relatively static (approximately 2 snags per acre) until 2034, and then gradually increases throughout the remainder of the modeled cycle reaching approximately 7 snags per acre by 2064. The Alternative 3 snag trend line remains slightly higher than that of Alternative 2 since less thinning would occur. These factors are anticipated to result in further within stand mortality given expected tree density and basal area, and competition for limited water, light, and nutrients. Available snag values after treatment in this alternative would also remain within the natural range of variability expected for large snags of 2-4 snags per acre typical of the Sierra Nevada.

In respect to large live tree density, Alternative 3 follows a generally increasing trend line throughout the modeled cycle. The trend line is similar to that of Alternative 2 until 2024, but then falls slightly below Alternative 2 for the next decade (2024 - 2034). The greater thinning of a diversity of size classes within the stand under Alternative 2 provides for a small level of growth expansion on remnant trees, increasing the availability of large live trees (≥24” dbh) slightly. From 2044 to 2054 Alternative 3 trend line increases above the Alternative 2 trend line, but ends slightly below the Alternative 2 trend line for 2064. As with Alternative 2, Alternative 3 would have limited effect on the overall availability of the large live trees or snags (≥24” dbh) since only trees 10” dbh and less would be felled.

Expected large snag and live tree densities post treatment followed by a wildfire (2034) are displayed in Figures 35 and 36. Conditions under this scenario mirror those anticipated with Alternative 2 suggesting that a greater percentage of large live trees would be retained in a fire event, than noted under the No Action Alternative with wildfire (2034). As with Alternative 2, thinning and fuel reduction actions associated with Alternative 3 are anticipated to increase stand resiliency in a fire event and promote better stability in the availability of indicator resources (large live trees and snags) over time than that of the No Action Alternative with a wildfire. A selection of Alternative 3 would maintain roosting habitat quality in a useable condition for the condor for both attributes through all timed phases.

Implementation of either Alternative 2 or 3, where forest thinning and fuel treatment occur, there is less large scale fluctuation in stand attributes important for the condor. Therefore they are viewed as providing a better continuum and mixed combination of both large, snags and live trees for use in the future.

FOREST SERVICE SENSITIVE SPECIES

Effects of the Proposed Project

Table 54 provides the primary metrics and indicators used to assess change and to evaluate the environmental consequences for the California spotted owl, northern goshawk, marten and bats species by alternative. Points of comparison between alternatives considered include the following: 1). Existing condition 2014; 2). Alternative 1 (No Action) and Action Alternatives (2 and 3) with treatment reflected in 2024; and 3). Alternative 1 (no treatment) with a modeled wildfire reflected in 2034, and Action Alternatives (2 and 3) with treatment with a modeled wildfire reflected in 2034.

Table 54. Selected primary metrics used to assess the effects of each alternative by species.

Species Name	Indicator of Change
California Spotted owl, Northern Goshawk, and marten:	**Metric 1. Total suitable habitat (CWHR 4M, 4D, 5M, 5D), acres treated, and change in project area CWHR score for suitable habitat types.**
	Metric 2. Weighted average change in important structural characteristics in suitable habitat types (CWHR 4M, 4D, 5M, 5D): • Change in dense canopy cover. • Change in live tree basal area (sq. ft./ac • Change in the number of live large trees (≥ 24"dbh) • Change in the availability of snags (≥15" dbh). • Change in the availability of large woody debris. • The degree to which fuels treatments may reduce the potential for the loss of above attributes from future wildfire events.
California Spotted owl[11]	**Metric 3. Acres treated in suitable CWHR Forest Types (4M, 4D, 5M, 5D), change in relative percent of suitable habitat at various scales of analysis, and change in CWHR score. Scales of analysis include:** • California spotted owl PAC • California spotted owl HRCA • 0.7 mile radius buffer • 1.5 mile radius buffer
Townsends big-eared bat, Pallid Bat and Fringed Myotis Bat:	**Metric 4. Change in CWHR Score**
	Metric 5. Change in snag density.
	Metric 6. Change in the availability of large live trees >24"

[11] No northern goshawk PACs or marten den buffers occur within the Tobias Project analysis area.

METRIC 1: Total suitable habitat (CWHR 4M, 4D, 5M, 5D), acres treated in the project analysis area, and change in relative CWHR score for suitable habitat types.

This metric evaluates existing suitable habitat (acres), proposed treatment acres, and the relative change in CWHR score. It provides an index of habitat quantity and quality over time. Project actions producing alterations in vegetation size and/or density classification and/or acres will be reflected through a change in relative CWHR score (See BE for more detail).

METRIC 2: Change of desirable stand characteristics which are most at risk and difficult to replace in suitable CWHR types. Scientific research regarding the species addressed under this metric has identified various fine scale structural attributes important based on their use and occurrence in occupied habitats. This metric track the anticipated changes in these structural attributes given each alternative (pre and post condition) and over time using FVS modeling. There are instances where the CWHR forest size and density classes utilized by a suite of species are very similar and therefore, for brevity purposes, the results and discussion will be in the same section.

METRIC 3: Acres Treated of CWHR Forest Types (4M, 4D, 5M, 5D), change in relative percent of suitable habitat at various scales of analysis, and change in California Wildlife Habitat Relationships (CWHR) score. Scales of analysis include: the PAC, the HRCA, 0.7 mile radius scale, and 1.5 mile radius scale. Several research studies suggest that loss or alterations of suitable habitat at various scales closest to existing California spotted owl Protected Activity Centers (PAC) may influence occupancy and reproduction. CWHR scores were calculated for each of these areas, and will be tracked to gain an understanding on how proposed actions may alter their suitability similar to Metric 1. Analysis will evaluate the change in acres of available suitable habitat as a result of proposed actions by scale.

METRICS 4 - 6: Changes in: CWHR score, snag density and distribution (trees ≥15" dbh), and availability of large live trees (≥24" dbh). The various bat species occupy of forest and brush landscapes. CWHR scores were calculated for each bat species based on scoreable vegetation types for each alternative. Changes in snags levels were also evaluated lower habitat quality. This metrics tracks changes in this attribute by alternative.

Direct and Indirect Effects: California Spotted Owl, Northern Goshawk, Marten:

The California spotted owl, northern goshawk and marten utilize forests with greater structural complexity, a higher representation of large live trees, and denser canopy (generally CWHR forest types with size and density classificaitons of 4M, 4D, 5M, 5D). Estimates of suitable habitat within the Tobias Project vary slightly but are quite similar for each species (spotted owl 2,149 acres, northern goshawk 2,069 acres, marten 2,064 acres). Therefore these species are evaluated collectively for Metrics 1 and 2 for brevity purposes. The CWHR scores calculated for each species differ slightly based on the acres of suitable habitat (4M, 4D, 5M, and 5D) and the assigned value for each vegetation type for the species.

METRIC 1: Total suitable habitat (CWHR 4M, 4D, 5M, 5D), acres treated in the project analysis area, and change in realative CWHR score for suitable habitat types:

Alternative 1 (No Action): A selection of Alternative 1 (No Action) would defer forest thinning and prescribed fuel reduction entries at this time. Based on FVS model predictions, the amount of moderate and high suitability habitat would increase 576 acres from an estimated

2,149 acres in 2014 to an estimated 2,725 acres by 2024 (Table 55). Existing condition CWHR scores calculated for each species are displayed for 2014 in Table 56. Increases in suitable habitat acres improve CWHR scores by +0.105 to +0.213, depending on the species. Alternative 1 retains the highest overall CWHR habitat score for suitable habitat for each species over either action alternative.

Table 55. Alternative 1 Existing Acres of Suitable Habitat (2014), Acres of Suitable habitat (2024), and Predicted Acres of Suitable Habitat with a Modeled Wildfire in 2034.

CWHR Size and Density	Acres of Existing Habitat (2014)	Acres of Habitat 2024 (No Treatment)	Acres of Habitat with No Treatment and Modeled Wildfire Reflected in 2034
		Alt. 1	Alt. 1
4&5 D	1,100	1,331	1
4&5 M	1,048	1,394	909
Total	**2,149**	**2,725**	**910**

FVS predictions for Alternative 1 with wildfire (2034), show a decrease in suitable habitat and a subsequent decrease in CWHR score for each species as displayed in Tables 55 and 56. Alternative 1 with wildfire (2034) also results in the lowest predicted CWHR score for suitable habitat types in comparison to either of the action alternatives where prior forest thinning and fuel reduction work would occur.

Table 56. CWHR Scores for Suitable Forest Types (4M, 4D, 5M, 5D) in the Tobias Analysis Area by Species, Alternative with Treatment (2024), and with Treatment followed by a Modeled Wildfire (2034).

	2014	2024			2034		
	Existing Condition	Alt. 1	Alt. 2	Alt. 3	Alt. 1 w/Fire	Alt. 2 w/Fire	Alt. 3 w/Fire
CA Spotted Owl	0.650	0.831	0.827	0.828	0.293	0.591	0.579
Northern Goshawk	0.784	0.997	0.991	0.985	0.330	0.653	0.629
Marten	0.669	0.774	0.771	0.770	0.287	0.563	0.542

A selection of Alternative 1 would forego reforestation improvements on approximately 3,070 acres of young planted or natural stands (size class 1&2) that are developing since the Stormy Fire (1991). The majority of planted stands are located in the mid slope region of the project area on good growing sites, but have become dominated by dense brush. Treatments proposed in action alternatives would work to reduce brush competition, providing for increased growing capacity on residual trees. Over time these actions would foster improvements in vegetative diversity/heterogenity, decrease fragmentation, and promote better forest continuity across the landscape.

Actions to thin existing mid-seral and mature stands would not occur. These stands currently support high tree density and greater stand density index values. Action alternatives would allow for light thinning of trees and brush to make small reductions in tree density, improve stand species composition, stand structure, and improve growth on residual trees (Silviculture Report, G. Powell 2015). These actions are anticipated to improve stand resiliency in a wildfire event, and to provide stand conditions that will improve tree survival in times of long term drought or insect/disease outbreaks. Predicted trends by scientists suggest a shift in climate conditions reflecting environments with warmer and drier regimes in the Western United States. These conditions may further intensify density related mortality in stands as trees respond to further drying conditions predicted for the future (McKenzie, et al., 2004). Previous State-wide reconniance flights to assess the effects of the current drought cycle, identifed moderate to high tree morality levels across the Forest. These include mortality at low elevation brush/forest interface and densely stocked forests at higher elevations. The most recent assessment covering the centeral and southern Sierra Nevada estimated drought related mortality at 10 million trees (USDA 2015)

Alternative 2: Alternative 2 would thin trees and brush to meet specific restoration and fuels reduction objectives. This alternative would treat approximately 1,502 acres (70%) of existing suitable habitat found within the project area as displayed in Table 57. This includes commercial forest thinning using skyline or tractor methods on approximately 852 acres, and non-commercial thinning on an estimated 650 acres. Approximately 647 acres of suitable habitat in the project area would receive no treatment. Implementation of Alternative 2 would also require 3.73 miles of new temporary road construction and the use of 1.51 miles of existing temporary road in areas of suitable habitat. The anticipated acres impacted from new temporary road construction and existing temporary road reconstruction have been incorporated as part of the commercial thin component.

Table 57. Acres of Existing Suitable Habitat (2014) and Proposed Treatment Acres by Alternative in the Tobias Analysis Area.

Forest CWHR Size and Density	Acres Existing Habitat (2014)	Alternative 2 Acres by Treatment Method			Alternative 3 Acres by Treatment Method		
		Commercial Thin*	Non Commercial Thin**	Not Treated	Commercial Thin	Non Commercial Thin	Not Treated
4&5 D	1100	463	357	280	0	820	280
4&5 M	1048	389	292	367	0	682	367
Total Acres	**2149**	**852**	**650**	**647**	**0**	**1502**	**647**

*Commercial forest thinning includes trees ranging in size from 10” to 29.9” dbh.

** Non-Commercial thin treatments include: Hand thin, hand thin & mastication, and hand thin and under burn activities. Non-commercial treatment actions are restricted to thinning small trees less than 10” dbh and brush, followed by pile and burn or pile and burn and under burn. The proposed under burn represents a separate entry, should pile and burn actions alone not meet fuel reduction objectives.

Table 58 diplays the estimated acres of suitable habitat retained post treatement as reflected in 2024, and with treatment and a modeled wildfire as reflected in 2034 by Alternative. Alternative 2 results in a 1% reduction in the overall quantity of suitable habitat, decreasing from 2,725 acres (Alt. 1 – No Action) to approximately 2,708 acres post treatment in 2024. Both positive and negative shifts in habitat quality would be realized through changes in CWHR size classifications (i.e. 3 to 4) and reductions in canopy cover (D to M) with implementation in some stands. These changes are reflected in the predictions of CWHR scores which show a slight overall decrease in habitat suitability for each of the species, from values noted in Alternative 1 (2024) (Table 56). A selection of Alternative 2 results in the lowest scored value post treatment in comparison to either Alternative 1 (no harvest) or 3 (small tree thinning only). However, regardless of alternative all outcomes remain within the moderate range for habitat capability (i.e. CWHR Score ≥ 0.66). More discussion on the qualitative changes in fine scale habitat attributes (i.e. canopy cover, large trees, etc.) are discussed in under Metric 2.

Table 58. Acres of Existing Suitable Habitat (2014), Acres of Suitable Habitat Post Treatment in 2024, and Acres of Suitable Habitat Post Treatment followed by a Modeled Wildfire Reflected in 2034 for the Tobias Analysis Area.

CWHR Size and Density	Acres of Existing Habitat (2014)	Acres of Habitat Post Treatment 2024			Acres of Habitat Post Treatment With Wildfire 2034		
		Alt. 1	**Alt. 2**	**Alt. 3**	**Alt. 1**	**Alt. 2**	**Alt. 3**
4&5 D	1100	1331	753	901	1	321	312
4&5 M	1048	1394	1955	1812	909	1465	1408
Total Habitat	**2149**	**2725**	**2708**	**2713**	**910**	**1786**	**1720**

Alternative 2 with wildfire (2034) provides the highest overall acres of suitable habitat retained (Table 58) and predicts higher CWHR scored values for each species over either Alternatives 1 or 3 (Table 56). Selections of either Alternative 2 or 3 are predicted to retain suitable habitat at higher acreage levels, and to maintain a greater percentage of forest types with the highest size and density classifications (4&5 D), important for the species, over that of Alternative 1 (Table 19).

Alternative 3: Alternative 3 would utilize non-commercial thinning methods as a means to meet specific restoration and fuels reduction objectives. This Alternative treats the same estimated 1,502 acres (70%) of suitable habitat as displayed in Table 57, however, it would limit forest thinning activities to small trees <10” dbh and brush. An estimated 647 acres of suitable habitat would not be treated. This alternative would have no new temporary road construction or reconstruction of existing temporary roads.

Results for this Alternative are displayed in a number of tables previously presented under Alternatives 1 and 2. These tables are appropriately referenced in discussions of Alternative 3 effects. Implementation of this alternative also results in a similar 1% reduction in the overall quantity of suitable habitat from the 2,725 acres predicted under Alternative 1 in 2024, in comparison to an estimated 2,713 acres post treatment with Alternative 3. As with Alternative 2, Alternative 3 presents some anticipated changes in size and density classifications in comparision to that of Alterntive 1 which are reflected in the predicted CWHR score as noted in Table 56. Over all Alternative 3 would retain more acres (901 acres) in forest types with higher density classification (i.e. D over M) in comparison to that of Alternative 2 (753 acres), but retains less acres than that of No Action (Alternative 1, 1,331 acres).

Predicted CWHR scores with Alternative 3 (2024) would be slightly higher for the spotted owl but slightly lower for the northern goshawk and marten in comparision to values predicted for Alternative 2, but lower in all cases in comparision to values predicted with Alternative 1 (2024). The minor increase or decreases predicted in CWHR scores for each species however would remain within moderate capability (>0.66).

When comparing Alternative 3 with wildfire (2034), it results in the second highest overall acres of suitable habitat retained next to Alternative 2 (Table 58) but results in lower CWHR scores for each species than that of Alternatives 2. A selections of either Alternative 2 or 3 is predicted to retain moderate and high capability habitats at higher acreage levels, and to maintain a greater percentage of forest types with the highest size and density classifications (4&5 D) important for the species addressed over that of Alternative 1 (Table 58).

METRIC 2: Change in important structural characteristics in suitable habitat types (CWHR 4M, 4D, 5M, 5D):

This section of the analysis discusses fine scale habitat attributes utilized by the spotted owl, northern goshawk, and marten which include maintainence of forest stands with greater canopy cover (generally in excess of 50%, with some stand greater than 70% canopy cover), live tree basal area typically in excess of 185 sq.ft./acre, higher availability of large live trees (>24"dbh), large snags (>15" dbh) (4 snags/acre), and availibility of large down woody debris (minimum 10-20 tons per acre). Actions that substantially modify these attributes will likely lower habitat quality.

Weighted average values for each of these attributes were calculated using FVS modeled predictions and the acres of suitable habitat anticipated with each alternative post treatment (2024), and post treatment with a modeled wildfire reflected in 2034. All results were then graphed over a 50 year period by alternative and encorporate changes in forest size and density classifications. Snag values were evaluated through plot data and visual observation, in comparison to the natural range of variability previously established. Large woody debris levels were evaluated based on plot data, and the stated retention standards stipulated in design features (10-20 Tons/Acre). For brevity purposes, graphs predict results for all alternatives and are initially presented in Alternative 1. They will be referenced as appropriate in further discussions involving the other action alternatives.

Canopy Cover and Live Tree Basal Area:

Alternative 1 (No Action): FVS modeling of suitable habitat types (4M, 4D, 5M, 5D) for both canopy cover and live tree basal area are diplayed in Figures 37 and 38. Absent of any forest thinning or fuel reduction work, weighted average canopy cover would marginally increase from approximately 57 percent (2014) to 60 percent by 2024 (Figure 36), and then exhibit a gradual decline reaching 55 percent by 2064. Weighted average live tree basal area (BA) increases from 319 Sq. Ft /Acre (2014) to approximately 357 Sq.Ft./Acre by 2024. The trendline continues to increase slightly until 2044 and then remains relatively static reaching 390 Sq.Ft. BA/Acre by 2064.

Alternative 1 with a wildfire (2034) shows that weighted average canopy cover and live tree basal area would endure a relatively steep decline based on FVS predictions. Weighted average canopy cover values decrease from 59 to approximately 28 percent post wildfire (31%). Recovery is limited over the remainder of the modeled cycle reaching an estimated 32 percent by 2064. Weighted avearage live tree basal area also shows a similar downward trend, declining from 380 Sq. Ft. BA/Ac to 154 Sq.Ft. BA/Acre in 2034. Both canopy cover and live tree basal area figures predicted by FVS would remain below the minimum recommendations to maintain suitable habitats with ≥50% canopy cover and ≥185 Sq. Ft. BA/Acre. The reductions in both of these attributes would decrease the probability for future occupancy by the California spotted owl, northern goshawk, and marten. Fire impacts observed with both the Stormy and McNally Fires, and predicted effects of wildfire on suitable habitat in the Tobias Project area, suggest that forests remain at relatively high risk for loss.

A trend would remain for forest stands to be dominated by a shade tolerant species mix and higher levels of small and intermediate sized trees that provide limited value for the species addressed. Over the long term, stands would be more prone to loss in wildfire events as previously discussed. Dense stocking levels will continue to curtail development and recruitment of larger trees to replace older ones as they age and die. Retaining extremely high stem density in stands reduces the potential for younger trees to be able to release and grow due long term supression and stagnation. The distribution of shade intolerant species, such as pines, would continue to decrease which were once more prevelant across the landscape of the Greenhorn Mountains. The presence of pines are a valuable component of Southern Sierran forests, particularily in light of ancitipated climate change. In larger size classes, pines are noted to have higher survival rates in wildfire events due to increased bark thickness thereby lowering the potential for bole damage, a significant contributor in post fire mortality (Silviculture Report, G.Powell 2015). A selection of either action alternative would do more to favor conditions that favor pines.

North et al. 2009 reviewed historical data (Bouldin 1999, Lieberg 1902), narratives (Muir 1911), and reconstruction studies (Barbour et al. 2002, Bonnicksen and Stone 1982, Minnich et al. 1995, North et al. 2007, Taylor 2004) and found that mixed-conifer forests were historcally highly clumped in their distribution with groups of trees providing dense canopy cover, separated by sparsely treed or open gaps. These conditions were driven in part by topography providing drier sites and more open forests on south facing aspects and along ridgetops; and denser canopied forests on moister sites such as north facing aspects, within valley bottoms, mid slope regions, and in riparian zones. Forests were further shaped by more frequent fire regimes than have been allowed to operate over the last century. Forest thinning and fuel reduction treatments proposed under the Tobias Project in action alternatives would work to increase vegetative heterogenity, increased prey availability, and improved forest resiliency under wildfire events (North et al. 2009, Silviculture Report, G.Powell 2015) over the No Action Alternative.

Figure 37. Weighted Average Canopy Cover for Suitable CWHR Habitats (4M, 4D, 5M, and 5D) for the California Spotted Owl, Goshawk, and Marten by Alternative with Treatment 2024, and with Treatment and Modeled Wildfire (2034)

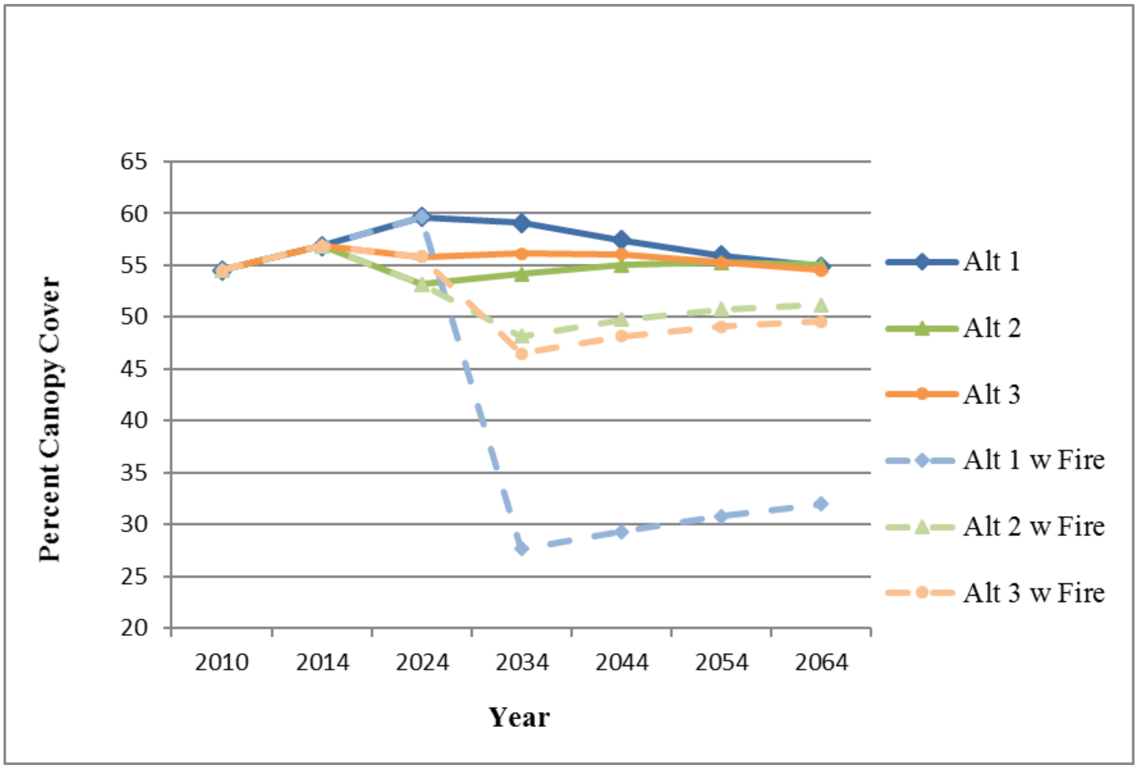
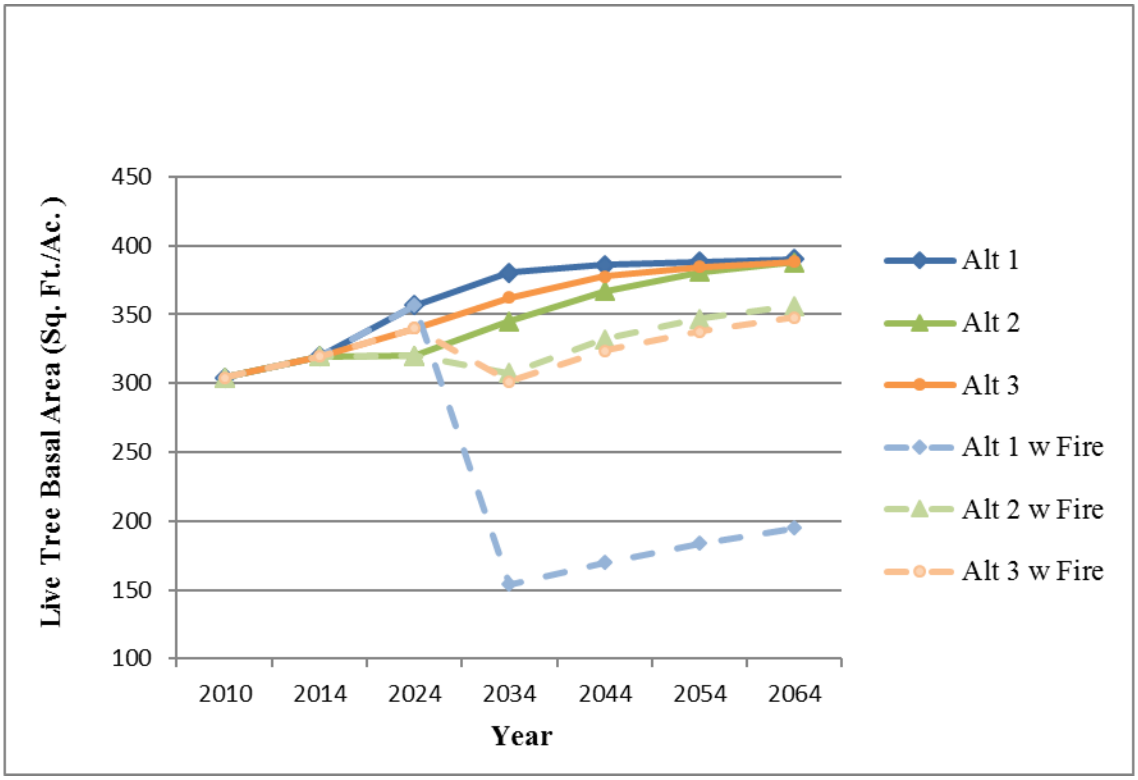


Figure 38. Weighted Average Live Tree Basal Area (Sq.Ft/Ac) for Suitable CWHR Habitat Types (4M, 4D, 5M, and 5D) for the California Spotted Owl, Goshawk, and Marten by Alternative with Treatment 2024, and with Treatment and Modeled Wildfire 2034.



Alternative 2: With a selection of Alternative 2, the weighted average canopy cover for suitable habitat types (4M, 4D, 5M, 5D) decreases approximately 7% from 60 (Alt. 1, 2024) to approximately 53 percent post treatment (Alt. 2, 2024)(Figure 37). This reduction would not occur on all areas of treated habitat since thinning activities would be more limited (or not occur) on north facing slopes, moister valley bottoms, portions of the mid slope region, and in riparian areas. Denser forest conditions would remain in these topographic regions and continue to provide suitable nesting/den habitat for the species considered. Approximately 657 acres of suitable habitat would receive no treatement

Alternative 2 with wildfire (2034) shows the trendline for weighted average canopy cover would drop from 60 pecent to 48 percent for a decade but then exceeds 50% for the remainder of the modeled cycle (Figure 37). In contrast predicted outcomes associated with Alternative 3 with wildfire show a lower intial value at 46 percent but exhibits a longer recovery period to reach 50% canopy cover (30 years). Alternative 1 with wildfire maintains the lowest canopy cover values of the three alternatives with wildfire (2034), predicting only 28 percent canopy cover post fire (2034) with limited recovery throughout the remainder of the modeled cycle reaching 32 percent by 2064.

Post treatment weighted average live tree basal area for suitable habitat types decreases from 357 Sq. Ft./Acre (Alt. 1, 2024) to approximately 320 Sq.Ft./acre (Alt. 2, 2024)(Figure 38), returning near the Alternative 1 trendline by 2064 (388 Sq. Ft./Ac). All predicted values would retain conditions within the range of variability noted for occupied nest/roost and den habitats of 185-350 Sq.Ft./Acre.

Weighted average live tree basal area post treatment with modeled wildfire (2034) for Alternative 2 would decrease to approximately 307 Sq.Ft./Acre, in comparison to lower estimates predicted for Alternative 3 at 301 Sq.Ft. /Acre, and 156 Sq. Ft. /acre with Alternative 1 with fire. Collectively a selection of either action alternative would result in conditions that fall within the range for occupied nest/den and roost habitats. Alternative 1 would retain conditions that remain outside the desired range of 185 to 350 Sq.Ft./Acre for approximately 20 years.

Alternative 3: With a selection of Alternative 3, the weighted average canopy cover is anticipated to decrease from 60 percent (Alt. 1, 2024) to approximately 56 percent post treatment (2024) (Figure 37). This represents a 4 percent decline for Alternative 3 verses a 7 percent decline with a selection of Alternative 2. Because Alternative 3 limits thinning actions to mostly smaller diameter trees less than 10" dbh and brush, the trendline for treatment alone shows weighted average canopy cover would stay higher than with Alternative 2 for most of the modeled period. The reductions anticipated with a selection of either action alternative, however, are congruent with recommendated standards and guidelines for treatment of mature stands (4M,4D, 5M, 5D) as specified in the 2004 SNFPA (USDA 2004). As with Alternative 2, conditions in some stands may fall below the desired canopy cover range typically associated with spotted owl nesting habitat (60%-95%), but it is anticipated that treated stands will exhibit a fair amount of heterogenity resulting in areas with higher canopy cover as previously discussed in Alternative 2.

In implementation of Alternative 3 with modeled wildfire (2034), the FVS predicts canopy cover would decrease to 46 percent, slightly lower than values noted with Alternative 2 (48 percent), but remain much higher than those anticipated with Alternative 1 with wildfire (28 percent). Alternative 3 with wildfire would have a longer recovery period in reaching 50% canopy cover (30 years) over that of Alternative 2 with wildfire (10 years).

Weighted average live tree basal area post treatment for Alternative 3 would decrease from 357 Sq. Ft./Acre to approximately 340 Sq.Ft./acre (2024). The overall trendline for Alternative 3 remains higher than Alternative 2 for approximately three and half decades, at which point all alternatives show a similar trend from 2054 to 2064 (Figure 38). Anticipated live tree basal area expected for either action alternative with treatment in 2024 would retain conditions within the range of variability noted for occupied nest/roost habitats of 185-350 Sq.Ft./Acre.

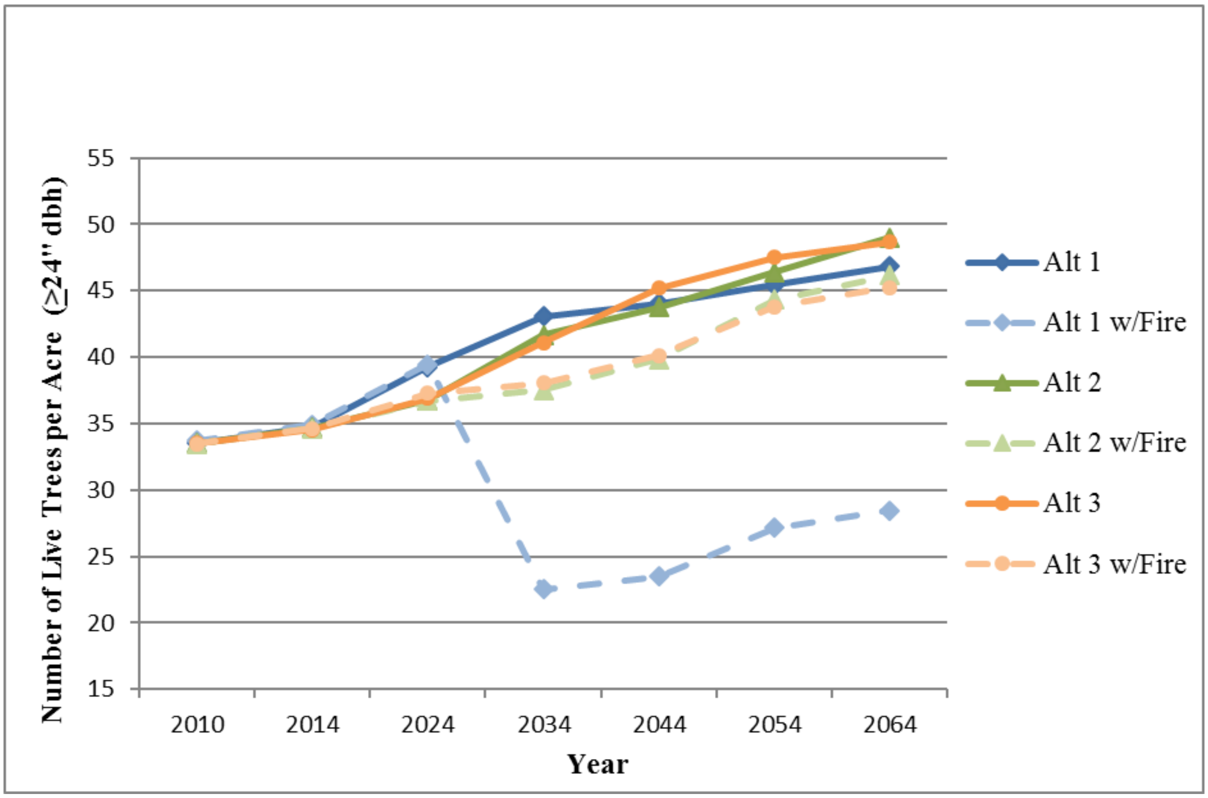
With implementation of Alternative 3 with a wildfire (2034), FVS predicts the weighted average live tree basal area would retain an estimated 301 Sq.Ft. BA/Acre. This value would be slightly lower than Alternative 2 with a modeled wildfire at 307 Sq.Ft. BA/Acre. Both action alternatives remain with higher values over that of Alternative 1 with wildfire at 154 Sq.Ft.BA/Acre. Predicted values for either action alternative would remain well within the range for occupied nest/den and roost habitats. In contrast with Alternative 1 with no prior treatment and a wildfire, predicted values would remain below the desired range of 185 Sq. Ft. BA/acre for 20 years.

LARGE LIVE TREES (≥ 24" dbh):

Alternative 1 (No Action): Graphed trendlines depicting the weighted average number of large live trees by alternative are displayed in Figure 39. Existing condition for Alternative 1 shows an estimated at 35 trees per acre in 2014 with an increasing trend expected for the remainder of the modeled period reaching 47 trees per acre by 2064. The values encompassed for all phases of the modeled cycle suggest adequate levels of large live trees would be retained to meet life requisite needs of each species considered.

In comparing the number of large live trees per acre in stands with no prior treatment and a modeled wildfire (2034), the trend line shows a steep decline from an estimated 43 trees per acre (Alt. 1) to approximately 23 trees per acre (Alt. 1 with wildfire). Values then gradually increase to approximately 28 trees by 2064 but remain well below those predicted with either action alternative where prior treatment would occur.

Figure 39. Weighted Average Number of Large Live Trees (≥24" dbh) per Acre for Suitable CWHR Habitat Types (4M, 4D, 5M, and 5D) for the California Spotted Owl, Goshawk, and Marten by Alternative with Treatment 2024, and with Treatment and Modeled Wildfire 2034.



Alternative 2: Weighted average large tree density decreases from 39 trees per acre (Alternative 1-No Treatment, 2024) to an estimated 37 trees per acre post treament (2024) (Figure 39). The density of large live trees would returns to Alternative 1 levels by 2044, and exceed it by 2064 at 49 trees per acre. All projected values would meet recommendations for the marten (USDA 2001), the spotted owl and northern goshawk for all phases of the modeled cycle.

In constrasting Alternative 2 post treatment with wildfire (2034), large live tree density would decrease from 43 trees per acre to 38 trees per acre but stays well above the values reported for Alternative 1 with wildfire where only 23 trees per acre would be retained.

Alternative 3: The weighted average number of large live trees for Alternative 3 is similar to that of Alternative 2 initially decreasing from 39 trees per acre (Alt. 1, 2024) to 37 trees per acre post treament (2024). However, the trendline for Alternative 3 returns to Alternative 1 levels sooner than would occur with Alternative 2. Regardless, all projected values would meet recommendations for marten (USDA 2001), the spotted owl and northern goshawk for all phases of the modeled cycle.

In constrasting Alternative 3 post treatment with wildfire (2034), large live tree density also stays well above the trendline projected for Alternative 1 with wildfire. Weighted average large live trees would decrease from 43 trees per acre to approximately 38 large live trees per acre post fire (2034) in comparision to 23 trees per acre with Alternative 1. All values predicted to remain post fire would exceed recommendations for retention with the species considered.

SNAG DENSITY AND LARGE DOWN WOODY DEBRIS:

Alternative 1 (No Action): The weighted average number of snags/acre for all modeled forest types by Alternative is displayed in Figure 40. Existing levels were estimated a little over 2 snags per acre at 2014. These values occur toward the lower end of the natural range of variability spectrum typical for Sierran mixed conifer forests as previously discussed (see Biological Evaluation). These values are also at the low end noted for occupied habitats. The Alternative 1 trend line however does show that values would increase to approximately 4 snags per acre by 2024 greatly improving conditions across the landscape. This upward trend continues throughout the remainder of the modeled cycle.

Snag density anticipated with a selection of Alternative 1 with a modeled wildfire (2034) shows a substantial increase would occur from approximately 7 snags per acre (Alt. 1 trend line, 2034) to approximately 30 snags per acre (Alt. 1 with fire trendline, 2034). This increase reflects the predicted tree mortality anticipated from the wildfire event based on the FVS model (Figure 40). Values anticipated for either of the action alternatives with fire (2034) would retain a greater percentage of live trees and therefore results in a snag density more in line with the natural range of variability expected for mixed conifer forests (0-12 snags per acre) in the Sierra Nevada.

It should be noted that the projections stated represent the best data available at the time of the analysis. Data for all modeled forest types was collected in 2010 prior to the drought. Snag density is calculated by entering plot data into FVS which models and predicts estimated snag levels. Plot exams don’t always capture true snag density well due to plot size and the randomized plot design. The scattered and often clumped nature of snags across any landscape therefore can miss areas with higher density. In addition FVS makes changes in snag development based on inter tree competition factors and stand density, in making out year projections. FVS doesn’t estimate rapid gains that can be incurred through episodic recruitment events such as the recent drought, and associated insect and disease factors. State-wide reconnaissance flights have been made in efforts to assess mortality levels from the drought experienced over much of California in 2015. These flights encompassed Sequoia National Forest and the Tobias Project Area. Reviews of this data suggest higher snag values ranging from 0 to 15 snags per acre (Figure 41). This increased trend has also been noted in ocular field reviews of the Tobias Project in late 2015. Therefore, existing snag levels are not anticipated to represent a limiting factor in this analysis for the species considered.

Figure 40. Weighted Average Snags per Acre (> 15" dbh) for all Modeled Forest CWHR Types in the Tobias Project Area with Treatment by Alternative (2024), and with Treatment and Modeled Wildfire 2034.

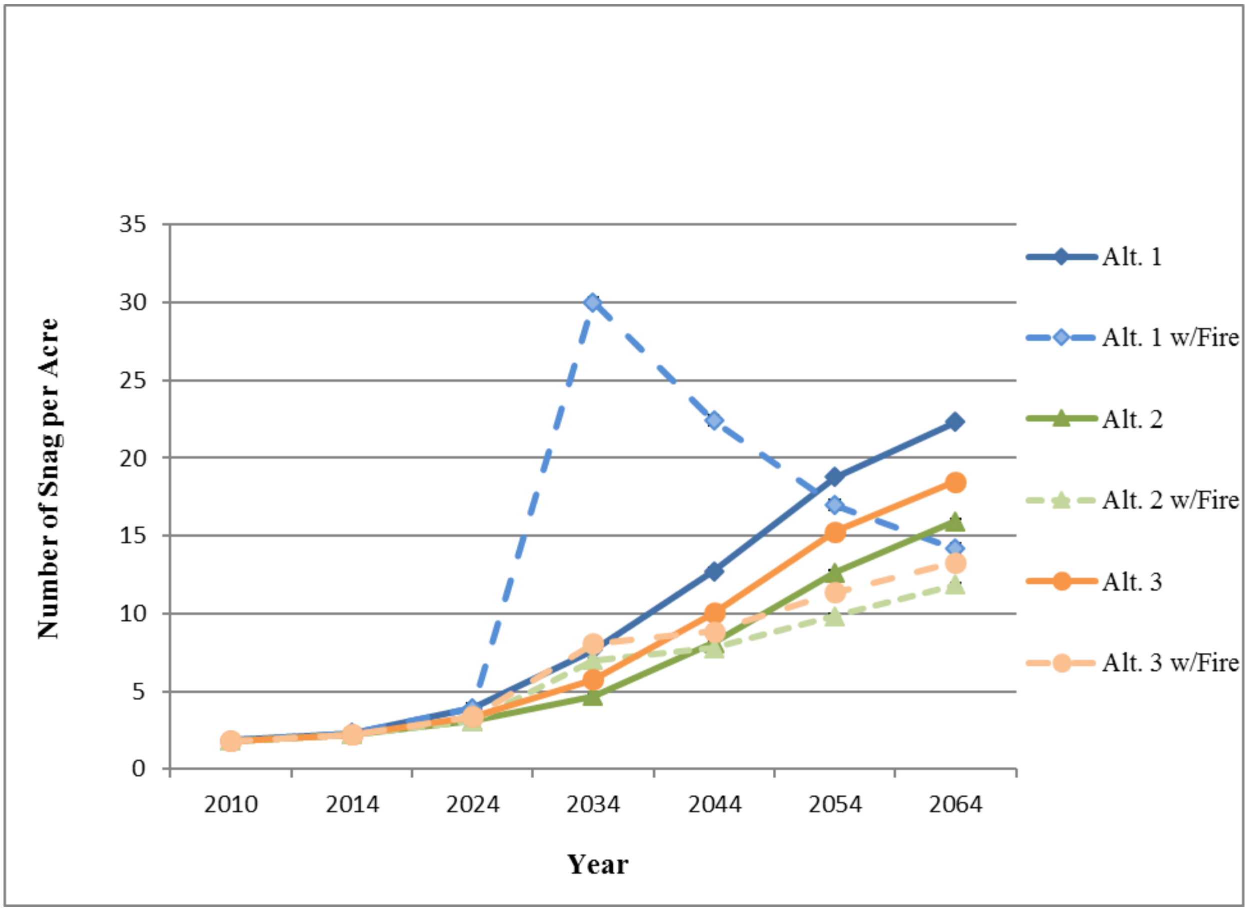
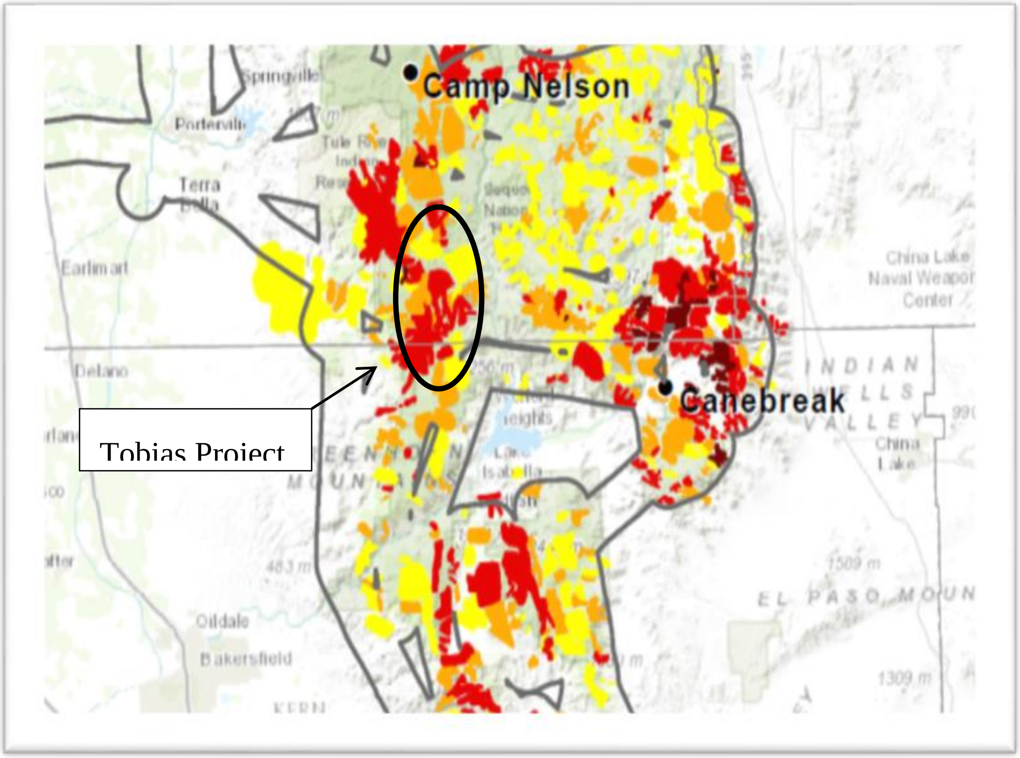


Figure 41. Projected Drought Related Tree Mortality from Flights Encompassing the Greenhorn Mountains and the Tobias Project Area (State of California, Department of Forestry, 2015).



Dead trees per Acre: Yellow = 0-5, Brown = 5-15, Red = 15 -40, Brick Red = 40+

Current estimates for large down woody debris from plot data in the project area was found to avegarge 25 tons per acre, with scattered pockets of over 40 tons/acre. These values would lie within desirable range noted for the species considered.

Alternative 2: Design features implemented as part of each action alternative requires that a minimum of 4 snags per acre (largest available) be retained per acre in forested areas. These can be averaged over a 10 acre block which allows managers to consider the random nature of snag development that occurs naturally throughout any landscape. All snags 30" dbh and greater would be retained unless deemed an imminent health and safety risk. FVS modeling for this alternative predicted that 3.1 snags per acre would be retained post treatment (2024). Over the long term without drought related mortality, Alternative 2 would have retained the lowest trendline in comparision to that of No Action or Alternative 3. Existing drought conditions however have increased tree mortality in the project area which can be captured to meet snag standards through proper implementation of design features.

Concern has been raised through the scoping process that thinning intermediate size trees negatively influences the recruitment pool for future large snags. The light nature of the proposed thin and the higher number of medium to large live trees already within existing stands (see discussion on large live trees) suggest that this is an unwarranted concern. Thinning activities are predicted to increase large live trees in the latter half of the modeled cycle that exceeds the Alternative 1 (No Action) trend line (Figure 38).

The weighted average snag density with a modeled wildfire (2034) with this alternative is predicted to retain 7 snags per acre, maintaining snag levels close to the Alternative 1 trend line with no wildfire. This would indicate that some live tree mortality occurs with the wildfire event as previously depicted in earlier discussions.

Current estimates for large woody debris from plot data show an average of 25 tons per acre. Values are anticipated to stay near these levels with slight increases by 2064. Design features stipulate retention of 10-20 tons/acre post project and have been utilized for several decades in management of spotted owl, goshawk, and marten habitats in Region 5. These values are anticipated to meet most life requisite needs where forested conditions exist. In the California spotted owl PAC pockets of higher levels of large woody debris (40 tons/acre) will be retained to maintain structural complexity for prey.

Alternative 3: FVS modeling predicts that regardless of alternative, the weighted average snag values for all modeled types is similar at 3.4 snags per acre by 2024 and likely higher given the current drought cycle. Alternative 3 with a wildfire (2034) would retain higher predicted snag values at 8 snags per acre in comparison to Alternative 2 with wildfire (7 snags per acre). With wildfire, both action alternatives would retain snag values lower than expected with Alternative 1 with wildfire, because less live tree mortality is anticipated providing benefits in canopy cover retention. Guidelines for implementation of action alternatives require that at least 4 snags per acre (largest available) be retained per acre (can be averaged over 10 acre block). In addition, all snags 30" dbh would be retained unless deemed and immediate health and safety risk. Large woody debris would be retained at levels to meet stated design criteria as previously discussed in Alternative 2.

METRIC 3: Acres treated in suitable CWHR Forest Types (4M, 4D, 5M, 5D), change in relative percent of suitable habitat at various scales of analysis, and change in CWHR score:

Metric three evaluates anticipated changes in spotted owl habitat at various scales from the activity center. Information regarding the various Alternatives and their influence on the California spotted owl is provided in several Tables and Figures. This information will be referenced as appropriate in discussions for each Alternative. These include:

- Table 59 displays the estimated percentage of suitable habitat remaining post treatment 2024, and post treatment with a modeled wildfire 2034 at each spatial scale.
- Table 60 displays the calculated CWHR Scores for each of the four spatial scales by alternative with treatment (2024), and with treatment and a modeled wildfire (2034). CWHR scores were based on all scored vegetation types identified as suitable habitat, given size and density classifications. Any non-scored CWHR vegetation types were assigned a zero value. Scored and non-scored vegetation types were then weighted by the total number of acres of each habitat within the scale of reference. In addition, a scored value was generated for the entire Tobias analysis area as whole (10,900 acres).
- Table 61 displays existing acres of suitable habitat (2014) and proposed acres treated by Alternative at each spatial scale analyzed. Suitable habitat acres available and those proposed for treatment may overlap between spatial scales given the concentric nature of this type of analysis.

- Figures 12 and 13 display the predicted distribution of available habitat and acres by alternative post treatment (2024), and post treatment with a modeled wildfire (2034).

Alternative 1: A selection of Alternative 1 would defer all forest thinning and fuel reduction work. Available habitat would be maintained in its current configuration (Alt 1, Figure 42, Table 59). FVS modeling predicts there would be minor increases in the amount of habitat at all spatial scales over the first decade ranging from an estimated +4 acres at the PAC scale to +185 acres at the home range scale (1.5 mile radius) by 2024 (See Alt. 1, Table 59). These changes are reflected by increases in CWHR score at each scale from existing condition 2014, to those anticipated in 2024 (Alt. 1, Table 60).

Available suitable habitat and its relative percent of each scaled area both in 2014 and 2024 meets recommendations established for this analysis. This would suggest there is a greater likelihood for continued spotted owl occupancy and reproduction. The pair did nest in 2015 which further supports the conclusion that habitat remains in a context and juxtaposition to allow for successful breeding and production of young.

A selection of this Alternative would not allow for hand thinning or mastication work to occur. These actions would continue to slow development and growth on young mixed conifer stands (both planted and natural regeneration) which are starting to recover since the Stormy Fire. Growth of young trees established since the fire are competing with dense brush that has become established on the site. Action alternatives would work to break up brush allowing the trees to release. Calculated CWHR scores at the largest spatial scales (i.e. 0.7 mile radius, 1.5 mile radius, and Tobias Project Area) encompass greater percentages of these stands which contribute to their lower scored values in comparison to scores at the PAC and HRCA scales (Table 60). The PAC and HRCA are located just above the mid-slope break, and were less impacted by the Stormy Fire initially. The higher predicted scores reflect their retention of suitable habitat (Table 60).

Implementation of Alternative 1 with wildfire (2034) predicts there would be a relatively steep drop in suitable habitat at all spatial scales (Table 59, Figure 43). At the 1.5 mile radius scale only 9% of the habitat would be retained, 11% at the 0.7 mile scale, with the PAC and HRCA scales retaining 23%, respectively. It is recognized that any fire event is complex and driven by a variety of factors such vegetation, past mortality, weather conditions and availability of fire suppression forces, etc. However, this type of modeling does provide some relative understanding of potential outcomes which could occur under summer conditions. Given this worst case scenario, it would appear that while not meeting desired acreage retention percentages, action alternatives that allow for forest thinning and brush treatment retain greater amounts of suitable habitat over that of Alternative 1.

Table 59: Acres of Suitable Habitat (4M, 4D, 5M, 5D) Retained at Four Spatial Scales and their Representative Percent of the Total Area by Alternative post treatment (2024) and with Treatment and a modeled wildfire (2034).

			ALTERNATIVE 1		ALTERNATIVE 2		ALTERNATIVE 3	
Spatial Scale	**Desired Range of Suitable Habitat in Acres and Percent of Total Scaled Area.**	**Existing Acres of Suitable Habitat (2014)**	**Acres of Suitable Habitat (2024)**	**Acres of Suitable Habitat with Wildfire (2034)**	**Acres of Suitable Habitat Post Treatment (2024)**	**Acres of Suitable Habitat Post Treatment with Wildfire (2034)**	**Acres of Suitable Habitat Post Treatment (2024)**	**Acres of Suitable Habitat Post Treatment with Wildfire (2034)**
1.5 Mile Radius (4,510 acres)	1,357 to 2,250 +	2,543	2,728	407	2,687	1,020	2,689	981
	30 to 50% +	56%	61%	9%	60%	23%	60%	22%
0.7 Mile Radius (1,062 acres)	467	587	658	119	652	375	652	369
	44% +	55%	62%	11%	61%	35%	61%	35%
Home Range Core Area HRCA=600	600	604	610	138	608	443	608	438
	100%	101%	102%	23%	101%	74%	101%	73%
Protected Activity Center (PAC=300).	300	305	309	70	307	216	307	220
	100%	102%	103%	23%	102%	72%	102%	72%

Table 60: Calculated CWHR Habitat Score at Four Spatial Scales of analysis from Spotted Owl Activity Center TUL0036.

Spatial Scale	**CWHR Scored 2014**	**CWHR Score 2024**			**CHWR Score 2034**		
		Alt. 1	**Alt. 2**	**Alt. 3**	**Alt. 1 w/fire**	**Alt. 2 w/fire**	**Alt. 3 w/fire**
PAC	0.649	0.664	0.663	0.663	0.398	0.593	0.594
HRCA*	0.587	0.616	0.616	0.617	0.158	0.539	0.538
0.7 Mile Radius	0.415	0.474	0.473	0.474	0.208	0.335	0.335
1.5 Mile Radius	0.438	0.510	0.508	0.508	0.216	0.293	0.291
Tobias Analysis Area	0.146	0.306	0.307	0.307	0.058	0.133	0.132

*The HRCA encompasses the PAC plus an additional 300 acres of suitable habitat (see figure 5).

Table 61: Acres of existing suitable spotted owl habitat and proposed treatment acres by Alternative and method.

Spatial Scale and Suitable Habitat CWHR Size and Density	Acres Existing Habitat (2014)	Alternative 2 Acres Treated			Alternative 3 Acres Treated		
		Commercial Thin*	Non Commercial Thin**	Not Treated	Commercial Thin	Non Commercial Thin	Not Treated
PAC							
4&5 D	211	0	155	56	0	155	56
4&5 M	94	0	60	34	0	60	34
Total Acres	**305**	**0**	**215**	**90**	**0**	**215**	**90**
HRCA*							
4&5 D	394	22	274	98	0	296	98
4&5 M	210	32	101	77	0	133	77
Total Acres	**604**	**54**	**375**	**175**	**0**	**429**	**175**
0.7 Mile							
4&5 D	430	66	197	166	0	263	166
4&5 M	157	31	85	42	0	116	42
Total	**587**	**97**	**282**	**208**	**0**	**379**	**208**
1.5 Mile							
4&5 D	1927	257	301	1,369	0	558	1369
4&5 M	55	200	141	555	0	341	555
Total	**2483**	**457**	**442**	**1924**	**0**	**899**	**1924**

***Commercial thinning includes felling of trees 10-29.9" dbh through tractor or skyline methods, ** Non-commercial thinning includes felling of small trees (<10" dbh) and brush by hand, hand and mastication or mastication. ***HRCA acres for commercial thinning occur outside the PAC but in HRCA. Post treatment fuel reduction actions include pile and burn. Pile and burn and under burn if needed to meet fuels objectives.**

Figure 42. Distribution of Suitable Habitat by CWHR size and density classifications at four spatial scales by Alternative Post Implementation (2024).

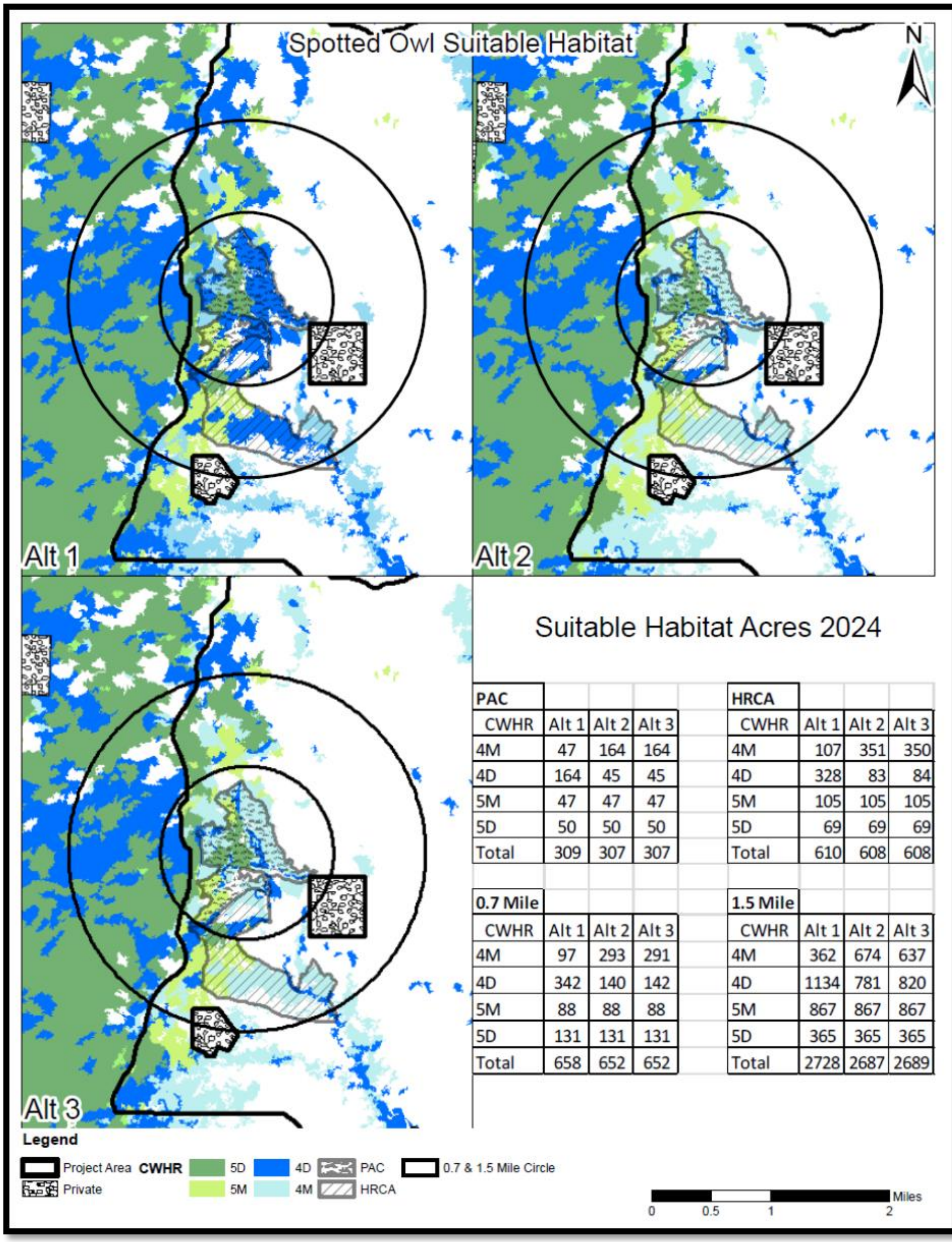
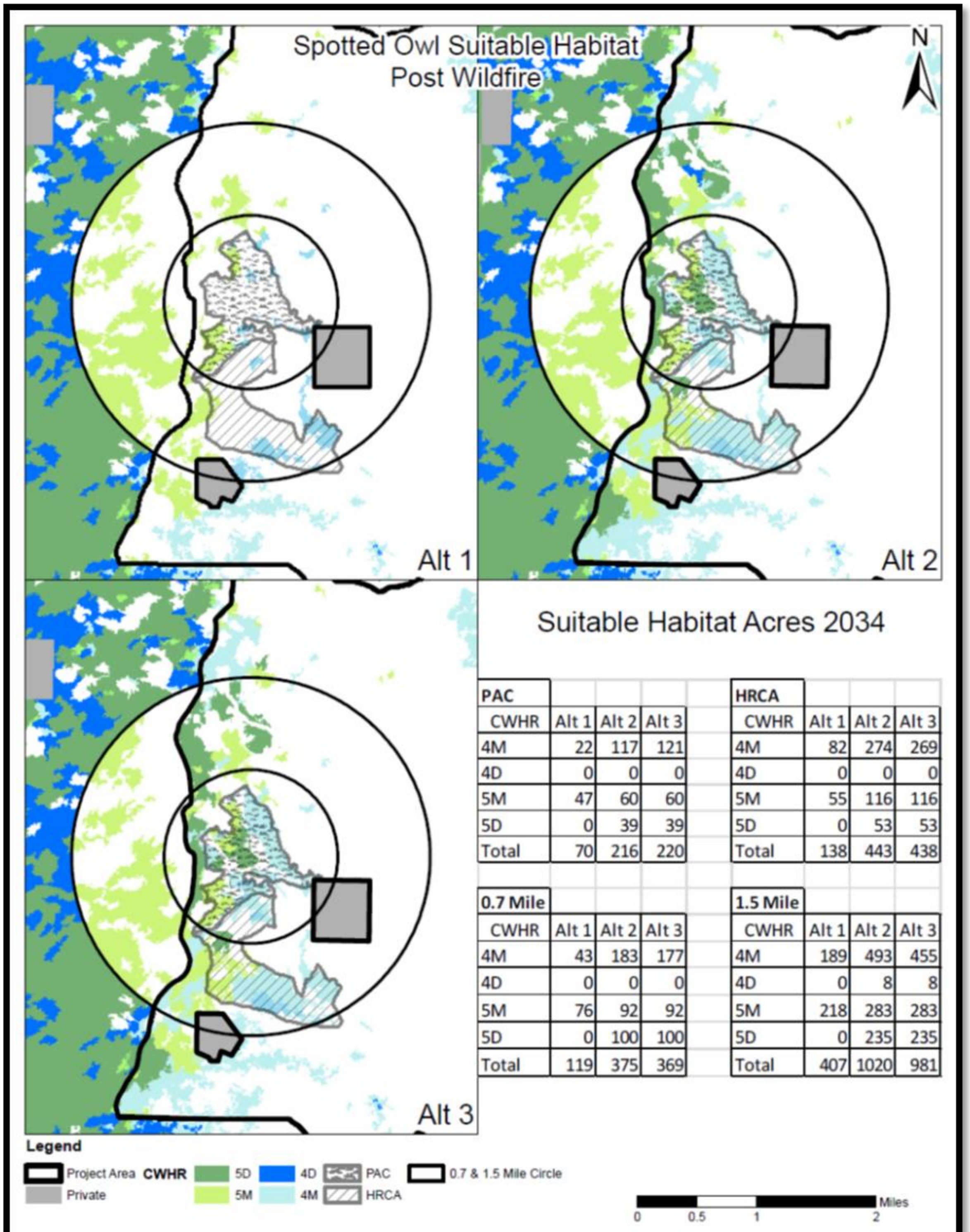


Figure 43. Distribution of Suitable Habitat by CWHR size and density classifications at four spatial scales by Alternative Post Implementation with a Modeled Wildfire (2034).



PAC			
CWHR	Alt 1	Alt 2	Alt 3
4M	22	117	121
4D	0	0	0
5M	47	60	60
5D	0	39	39
Total	70	216	220

HRCA			
CWHR	Alt 1	Alt 2	Alt 3
4M	82	274	269
4D	0	0	0
5M	55	116	116
5D	0	53	53
Total	138	443	438

0.7 Mile			
CWHR	Alt 1	Alt 2	Alt 3
4M	43	183	177
4D	0	0	0
5M	76	92	92
5D	0	100	100
Total	119	375	369

1.5 Mile			
CWHR	Alt 1	Alt 2	Alt 3
4M	189	493	455
4D	0	8	8
5M	218	283	283
5D	0	235	235
Total	407	1020	981

Alternative 2: A selection of Alternative 2 would implement forest thinning and fuel reduction work as shown Table 61. After treatment suitable habitat would be maintained in the configuration as displayed in Figure 42 (Alt 2). FVS predicts there would be incremental decreases in the overall amount of suitable habitat (acres) (4M, 4D, 5M, 5D) at all spatial scales over the first decade ranging from an estimated -2 acres at the PAC/HRCA scales to a high of -41 acres at the home range scale (1.5 mile radius) by 2024 (See Alt.2, Table 59). Acres of suitable habitat retained and its relative percent of each scaled area post treatment would continue to meet recommendations established under this analysis, and as reflected by minor decreases in CWHR scores in comparison to Alternative 1 (Table 60).

With Alternative 2 and wildfire (2034), FVS predicts that more acres of suitable habitat at all spatial scales would be retained (PAC 216 acres, HRCA 443 acres, 0.7 mile radius 375 acres, and 1.5 mile radius 1,020 acres), in comparison to Alternative 1 with a wildfire (PAC 70 acres, HRCA 138 acres, 0.7 mile radius 119 acres, and 1.5 mile radius 407 acres)(Figure 43). That said, the amount of suitable habitat retained and its representative percent of the total scaled area would remain below desired objectives. In comparisons, CWHR scores at the PAC and HRCA scales would remain highest with a selection of either action alternative with wildfire (2034) over that of No Action. At the largest spatial scales only smaller positive differences in CHWR scores were noted

Activities proposed in the PAC are the same for both Alternative 2 and 3, and limited to hand thinning of small trees and shrubs, pile burning, and underburning if needed. The FVS model predicts there would be a net decrease of 2 acres as previously stated (CWHR 4M, 4D, 5M, 5D) at both the PAC and HRCA scales. The boundaries of the PAC and HRCA were established using prominent typographic features to allow for ease in field delineation and encompass 327 acres and 705 acres, respectively. As drawn they are larger than required under the 2004 SNFPA. Therefore although a 2 acre decrease is noted from Alternative 1 values (2024) to that of Alternative 2, the net acres of suitable habitat retained (4M, 4D, 5M, 5D) within each would meet standards and guidelines post implementation (USDA 2004). Design features include measures to retain all snags in the PAC, unless a significant safety hazard, and an average of 10-20 tons per acre of large woody debris. Provisions also state that some scattered areas of higher large woody debris concentrations up to 40 tons/acre will be retained at the Biologist's discretion in portions of the PAC.

While the FVS doesn't predict substantial changes in the overall amount of suitable habitat in acres, it does predict that forest thinning would result in shifts in habitat quality at all spatial scales through decreases in canopy cover. These changes would affect an estimated 119 acres of suitable habitat at the PAC scale, 245 acres at the HRCA scale, 202 acres at the 0.7 mile radius scale, and 353 acres at the 1.5 mile radius scale[12] (Figure 42). Primary shifts in canopy cover result from a change from a CWHR 4D to a 4M (2024). At the PAC scale these changes will result in a decrease in canopy cover of approximately 10% on affected acres but have benefits in lowering fire risk. The weighted average change in canopy cover for all suitable habitat collectively at each scale by alternative (2024) and post implementation with wildfire (2034) is shown in Table 62.

[12] Acres displayed at the smallest spatial scales are generally nested within those at larger scales. Total acres affected would be displayed at the 1.5 mile radius scale (home range scale).

Table 62. Estimated Weighted Canopy Cover for all Suitable Habitat Types at Various Spatial Scales by Alternative Post Teatment (2024), and by Alternative Post Treatment with Wildfire (2034).

	2024			2034		
	Alt. 1	Alt. 2	Alt. 3	Alt. 1 w/fire	Alt. 2 w/fire	Alt. 3 w/fire
PAC	63	54	54	31	42	42
HRCA	62	51	52	32	42	42
0.7 mile	63	56	56	28	41	41
1.5 mile	59	55	56	27	35	34

Nest stands (PAC) typically are dominated by mature forest with high canopy cover (> 70%), an abundance of large trees, and a multi-storied condition comprised by trees with a variety of size classes (USDA 2004). Temple et al. 2014 found that high canopy cover was a more important habitat component than large trees, although forests containing both were probably the highest quality. The specific reasons for why high-canopy forests are important remains unknown, but prey availability, predator avoidance, or microclimate are suspected as important factors (Verner et al. 1992 IN:Temple et al. 2014, Keane 2014). Keane (2014) reviewed several studies that used modeling of habitat conditions along with adult survival and occupancy data which showed a positive association with the amounts of mature forests (Blakesley et al. 2005, Dugger et al 2005, 2011, Franklin et al. 2000,and Olsen 2004). Keane (2014) also noted that "territory occupancy was positively related to the amount of mature forest at core scales" (this analysis HRCA and 0.7 mile radius) for both the California and northern spotted owls, with higher colonization rates and lower extinction rates associated with territories with greater amounts of mature forest (Blakesley et al. 2005, Dugger et al 2005, and Seamans and Gutierrez 2007). Blakesley et al. (2005).

A selection of either Alternative 2 or 3 at the PAC, HRCA, and 0.7 mile radius scales is predicted by FVS to provide lower canopy cover in comparison to Alternative 1 (No Action). Therefore these changes although modest have the potential to lower the probability for pair occupancy and may result in short term fluctuations in reproductive success given the acreage amounts treated. That said the tradeoff of not treating the PAC coupled with a summer wildfire event, shows that suitable habitat would be left with even lower canopy cover levels than with either action alternative with wildfire (See values with Alt. 1 with Wildfire)(Table 59, Figure 43). With treatment of 4 D forest types the resulting quadratic mean diameter of live trees would increase from 13" dbh to 19"dbh (2024) reaching 28" dbh by 2064. With a selection of Alternative 1 these stands were predicted to retain trees at 13" dbh at 2024 and only reach 24" dbh by 2064. On an immediate basis the Tobias Project is expected to decrease the potential for crown fire to develop from adjoining brush fields downslope of the PAC, and improve growth on residual sapling and pole trees currently being suppressed by brush. This would work to increase forest continuity over the long term. Within the PAC light thinning of ladder fuels may increase foraging opportunity by owls by increasing flight space. FVS predicts that CWHR forest types with 5D or 5M size and density classifications that provide highest quality habitat within the

PAC/HRCA would not have any appreciative change in size class or in canopy cover (Figures 42).

Alternative 3: A selection of Alternative 3 would implement forest thinning and fuel reduction work as shown Table 61. After treatment, suitable habitat would be retained in the configuration as displayed in Figure 42 (Alt 3). FVS modeling predicts there would be minimal decreases in the overall amount of suitable habitat as defined by the Forest Service (4M, 4D, 5M, 5D) at all spatial scales in the first decade ranging from an estimated -2 acres at the PAC/HRCA scales to a high of -39 acres at the home range scale (1.5 mile radius) by 2024 (See Alt.3, Table 59). The total amount and percentage of suitable habitat retained at each scale would continue to meet recommendations established under this analysis post treatment (PAC 307 acres, HRCA 608 acres, 0.7 mile radius 652 acres and 1.5 mile radius 2,689 acres). The changes in suitable habitat are reflected by minor decreases in CWHR scores noted for Alternative 3 (2024) in comparison to Alternative 1 (Table 60).

Similar outcomes would be expected with proposed treatment of PAC, HRCA, and 0.7 mile radius scales for both Alternative 2 and 3 and have been adequately discussed under Alternative 2. FVS predicts that thinning of 4D types would produce changes in habitat quality on 119 acres at the PAC scale, 244 acres at the HRCA scale, 200 acres at the 0.7 mile radius, and 314 acres at the 1.5 mile radius scale due to decreases in canopy cover post implementation. These alterations result from a change to a density classification of 4M (2024) as displayed in Figure 12. Therefore, these reductions have the potential to negatively influence the owl pair.

Treatment of 4D habitat may provide some incremental benefits through removing small trees increasing the quadratic mean diameter of trees post treatment. These actions would lower competition factors on existing trees faced with limited resources, and improve the potential for better forest resiliency in a wildfire event. With a modeled wildfire implemented post treatment and displayed in 2034, FVS modeling predicts that Alternatives 3 would retain more acres of suitable habitat at all spatial scales (PAC 220 acres, HRCA 438 acres, 0.7 mile radius 369 acres, and 1.5 mile radius 981 acres), in comparison to Alternative 1 with a wildfire (PAC 70 acres, HRCA 138 acres, 0.7 mile radius 119 acres, and 1.5 mile radius 407 acres)(Table 59, Figure 43). The amount of habitat and its relative percent of each scaled area would remain below desired objectives previously stated. Table 60 displays predicted CWHR scores for the PAC and HRCA by Alternative with treatment (2024), and with treatment and a wildfire (2034), compared to Alternative 1. Significant differences are noted between Alternative 1 with wildfire and either action alternative given treatment and a modeled wildfire (2034).

Townsend's Big-eared Bat, Pallid Bat, and Fringed Myotis Bat:

METRIC 4: Change in CWHR Score

Alternative 1: All three bat species are assumed to occur across the forest at relatively low density based on limited surveys and literature reviews. Calculated CWHR scores given existing habitat (2014) range from 0.180 to 0.182 for the Townsend's big-eared bat and fringed myotis bat, respectively, with a CWHR score of 0.512 for the pallid bat (Table 63). Scored values increase by 2024 for the first two bat species and decrease slightly for pallid bat for the same period. The observed habitat decline noted with the pallid bat is associated with brush fields that begin to transition to young conifer stands given normal growth. Despite these alterations any low density use that occurs in the project area would be expected to continue given no treatment or wildfire.

Alternative 1 with wildfire (2034) shows CWHR scores for the fringed myotis bat and Townsend's big-eared bat decrease to 0.098 and 0.150 respectively, with the pallid bat score increasing to 0.602 as a result of more open habitat. Predicted CWHR scores for either Alternatives 2 or 3 with wildfire remain slightly higher than with Alternative 1 and wildfire (2034) for the fringed myotis and Townsend's big-eared bat, and result in slightly lower scores with the pallid bat since less habitat is impacted by fire.

Table 63. CWHR habitat scores for bat species under existing condition (2014), by Alternative post treatment (2024), and by Alternative post treatment with a modeled Wildfire (2034).

Species Name	2014	2024			2034		
	Existing Habitat	ALT. 1	ALT. 2	ALT. 3	Alt. 1 w/fire	Alt. 2 w/fire	Alt. 3 w/fire
Fringed Myotis bat	0.182	0.316	0.316	0.315	0.098	0.155	0.155
Townsend's big-eared bat	0.180	0.312	0.313	0.312	0.150	0.158	0.159
Pallid bat	0.512	0.312	0.312	0.312	0.602	0.583	0.583

Alternatives 2 and 3: A selection of either Action Alternative would result in forest thinning and brush treatment on similar amounts of suitable habitat. For the pallid and fringed myotis bats this would include an estimated 4,875 acres treated, with approximately 4,845 acres of Townsend's big-eared bat habitat treated. Collectively these actions would affect roughly 45% of the available habitat.

Little appreciative change in score is noted between Alternatives 2 and 3, or in comparison with Alternative 1 (2024). Bat response to forest thinning and fuels treatment including wildfires vary by species but generally suggest a neutral to positive benefit for many bat species groups (Loeb and Waldrop (2008), and Buchalski et al. 2013). Loeb and Waldrop (2008) in their study involving big brown bats, eastern red bats and eastern pipistrelle bats showed that activity was significantly greater in thinned stands, intermediate in activity with burn and thin stands or with burn only stands, and lesser activity in control stands. The decrease in the clutter of small dense trees was thought to improve foraging and commuting activity in the Piedmont region. Humes et al. (1999) found bats to be more active in old-growth and thinned forest stands than in dense, un-thinned stands, suggesting that the increased structural diversity benefitted bats.

Buchalski et al. 2013 monitored bat response from McNally Fire (150,000 acres, 2002) located on Sequoia National Forest. In this study they found no significant negative effects of fire on bat activity in mixed-conifer forests one year after, supporting the view that forest bat communities are resilient to fire and that fire may enhance foraging opportunities.

Buchalski et al (2013) noted that "the wildfire-landscape mosaic did not affect bat activity in unburned stands of any of the six phonic groups. Some stands had up to 30% of the surrounding landscape within a 2 km radius burned with stand replacement fire. Despite this, activity was neither higher (due to immigration or species preferring unburned conditions) nor lower (due to emigration to favored habitat conditions elsewhere), suggesting that bat communities do not respond to forest landscape conditions in a manner similar to that documented for terrestrial birds following fire. Rather, bats are likely foraging and roosting across a much broader spatial scales, resulting in greater resilience to changes at this scale".

Several researchers speculate that bat response and activity associated with forest disturbances such as thinning or wildfire are attributed to increases in foraging habitat quality by reducing the amount of vegetation in the forest canopy and understory (commonly referred to as clutter) that can obstruct flyways effecting echolocation. Previous studies have shown that dense clutter appears to decrease foraging ability and success (Brigham et al. 1997, Erickson et al. 2003, sleep et al. 2003 and Rainho et al 2010). In respect to wildfires or other fuels treatments involving fire, several studies suggest that this type of disturbance increases abundance of insect prey through post-fire growth of plant species that increase terrestrial insect activity (Lacki et al. 2009, Swengal 2001). It is believed these alterations likely benefit bat foraging

METRIC 5 - Change in snag density and distribution:

Alternative 1: With a selection of Alternative 1 the availability of snag density and its distribution would remain similar to existing conditions previously discussed for this attribute. FVS predictions estimated 4 snags per acre by 2024, reaching an estimated 22 snags/acre by 2064. There is a high likelihood that FVS predictions for existing snag density are low, given new mortality evident with the current drought.

A selection of this Alternative would not allow for forest thinning and brush manipulation to occur which may increase the propensity of Tobias landscape to remain at high fire risk. With a wildfire event, a substantial increase in snag density is predicted by FVS increasing from approximately 7 snags per acre (Alt. 1, 2034) to approximately 30 snags per acre (Alt. 1 with wildfire trend line, 2034). These levels would exceed values for typical snag NRV for mixed conifer stands. Regardless, these projected changes in snag density with wildfire are not anticipated to shift incidental bat use in the project area, and may result in increased availability of roosting structures post wildfire.

Alternatives 2 and 3: FVS modeling for these alternatives predicts similar snag density levels for either Action Alternative would be retained post treatment (3-4 snags/acre). Implementation of either is anticipated to meet standards and guidelines post treament to retain 4 snags per acre (largest available) in forested habitat given observed tree mortality in the project area. In addition, the SNFPA (USDA 2004) retains all snags and live trees greater than 30" dbh unless deemed a imminent safety hazard. Therefore it is anticipated that the greatest percentage of these trees would be retained and continue to provide optimal habitat for bat occupation.

METRIC 6: Change in the availability of large Live Trees (> 24" dbh) -

Alternative 1: The availability of large live trees is not anticipated to be a limiting factor given their availability across the forest landscape, and expected incidental use of such substrates by bats. FVS predicted a weighted average of 35 trees per acre in 2014 exceeding to 47 trees by 2064. These trees would serve as an adequate recruitment pool for future snag development in large size classes.

With Alternative 1 with wildfire (2034) the FVS predicts the weighted average large live tree density would drop by half, decreasing from 43 trees per acre to approximately 23 trees per acre. Despite the lower numbers of large live trees and available recruitment pool, adequate habitat for incidental use is expected to occur. Fire would likely damage some sections of live trees, or create new snags that could be useful for bat species.

Alternative 2 and 3: Effects to large live tree attributes for Alternative 2 and 3 are relatively similar and only lie slightly below Alternative 1. The majority of forest thinning (both commercial and non-commercial) would select trees less than 24"dbh, which is reflected in the similar trend line noted for 2024 (Figure 39). Prescribed underburning which would occur in both action alternatives however result in minor loss of larger trees causing the Alternative 3 line to drop to the same curve expected with Alternative 2. Fuels treatments such as pile and burn, jackpot pile and burn, or understory burn would implement measures to prevent significant loss of large live trees.

OTHER DIRECT AND INDIRECT EFFECTS COMMON TO ALL ACTION ALTERNATIVES (ALTS. 2 AND 3):

California Spotted Owl, Northern Goshawk, Marten, Townsend's Big-eared Bat, Pallid Bat, and Fringed Myotis Bat:

Disturbance: Alternatives 2 and 3 propose to treat an estimated 4,988 acres in total, within the project area. Disturbance related influences are generally limited to areas of suitable habitat within ¼ mile of the nest/den location where forest thinning, temporary road construction, and prescribe burn operations would occur. Increased levels of disturbance near these site have the potential to cause temporary site abandonment due to increased noise or human encroachment, injury or death of an individual from burning or felling of a large tree (live or dead) that is unknowingly being used, to short term alterations in normal foraging patterns. Disturbance effects have the greatest potential for harm during critical phases of the reproductive cycle potentially limiting the annual recruitment of young.

To ameliorate these potential effects, the 2004 SNFPA (USDA 2004) standards and guidelines impose species specific Limited Operating Periods (LOPs) that will be applicable for the Tobias Project. These measures are specified in the design features by species (See LOPs for California spotted owl, northern goshawk, and marten). The SNFPA does not specify LOP restrictions for bat species but the others implemented fall within the same reproductive period known for bats. Further guidelines have also been stipulated in design features that no vegetation removal or burning work would occur within 100' of the Deep Creek Cave entrance to limit potential changes in air flow and temperature.

Commercial felling of important physical structures such as large live trees or large snags (≥30" dbh) most commonly utilized for nest/roost trees for forest interior species addressed would not occur unless deemed a health and safety hazard tree. Therefore, implementation of either Action Alternative is not anticipated to significantly alter their distribution and occurrence across the landscape.

With project activities of noise (people, chainsaws, etc.), there is a potential of a missed feeding attempt by activities, however, it would not preclude a future feeding attempt. All three species are most active at night, whereas most project activities would occur during daylight hours, hence the disturbance of a missed feeding is extremely low.

Project implementation for forest thinning and fuels reduction work will not occur all at once but work to treat manageable blocks. Limiting block size, coupled with stated LOPs, will provide areas without these increased disturbance effects over the project area. Prescribed fuels treatment methods under controlled conditions, would occur in late fall after the breeding period and designed in such a way to limit smoke production and its residual effects.

Fuel Treatment Effects (pile and burn, jackpot pile and burn, and understory burn):

The impacts associated with forest thinning and fuel reduction work would be similar for each alternative and are not anticipated to result in large decreases in habitat quantity or quality. All fuels reduction work would be conducted under controlled conditions which lower fire intensity and impacts to forest stands. Some torching of individual trees, or groups of trees, may occur creating small openings thus increasing heterogeneity. Additional edge habitat would become more evident over the short term between existing mature stands, thinned planted stands, and brush complexes. All of the above species have been noted to opportunistically forage along such edge environments provided that mature habitat remains adjacent to more open habitats. Individuals may experience an increase in prey detection and capture over the short term (1-3 years). Pile/burn and jackpot pile and burn operations allow increase flexibility to maintain desirable stand attributes such as large live trees, large woody debris, and large snags.

Difference in prey composition and relative abundance of prey items may occur as thinning and fire favors some prey species and negatively influences others. The general trend noted in the literature however indicates that while compositional changes in prey may occur, prey density levels remain relatively stable. Small tree thinning and brush removal associated fuel reduction activities are not anticipated to dramatically affect key prey resources utilized by the California spotted owl. The flying squirrel is associated with mature forests with dense canopy (>50%), in relatively close proximity to perennial streams (Myer et al. 2005). Nests are located in cavities in live and dead trees at the mid canopy level. Availability of downed woody debris will allow corridors for the flying squirrel on the ground. Little appreciative change in the availability of large live trees, overhead canopy, or riparian environments is anticipated, and thereby will continue to provide habitat generally acceptable for the flying squirrel.

Some loss of medium to large snags across the project area is expected due to the removal of imminent hazards, but snag levels across the project area will retain a minimum of 4 snags per acre or more post treatment. Woodrat habitat may be more vulnerable in planted stands where pole size trees and dense brush exist. Woodrat nests can be located closer to the ground and potentially lost through burning operations. However, the primary use of pile and burn or jackpot pile and burn methods would leave many places unaffected by fire. Impacts from understory burning would also not consume all treated areas due to differences in vegetation, soil moisture, topography and aspect, and the timing of the burn (usually fall). Collectively, actual blackened acres would be significantly smaller than the entire unit, and various islands of untreated habitat will remain. Woodrats and other spotted owl prey species have evolved in the presence of frequent, low-to-moderate intensity fires, which would be mimicked when conducting burn operation under controlled conditions. Therefore, any potential effects from prescribed burning in the project area are anticipated to be short term.

Measures have been included within design features to protect woodrat nest when possible.

The northern goshawk forages over a wide variety of forest environments including both closed and moderately open canopies. It feeds on a diversity of both mammal and bird species all of which are relatively common on the landscape and habitat generalists themselves. None of these prey species have been noted to be at risk or in decline. Many find niche habitats along downed logs or use snags as a form of cover or for food resources. Adequate snag levels, ground cover, and large woody debris (average 15 tons/acre, range of 10 to 20 tons per acre) will remain post treatment.

The marten is also a prey generalist eating a wide diversity of items, including small to mid-sized mammals, birds, fruits and nuts, vegetation, and carrion. Martin (In: Buskirk and Powell 1994) suggests that their ability to adjust predatory patterns and prey type are important factors that enable them to balance energetic needs. The broad array of food items utilized by these species and the nature of the expected treatment in context of the larger landscape eliminates concern for substantial shifts in food resources.

Bat response to forest thinning and fuels treatment including wildfires generally suggest a neutral to a positive benefit for many bat species groups (Loeb and Waldrop (2008), and Buchalski et al. 2013). Loeb and Waldrop (2008) in their study involving big brown bats, eastern red bats and eastern pipistrelle bats showed that activity was significantly greater in thinned stands, intermediate in activity with burn and thin stands or with burn only stands, and lesser activity in control stands. The decrease in the clutter of small dense trees was thought to improve foraging and commuting activity in the Piedmont region. Humes et al. (1999) found bats to be more active in old-growth and thinned forest stands than in dense, un-thinned stands, suggesting that the increased structural diversity benefitted bats.

Use of prescribe fire techniques post thin are anticipated to produce a negligible to positive effect on the bat species addressed. A recent study by Buchalski et al.(2012) evaluated the effects of wildfire severity on bats at both stand (< 1 hectare) and landscape scale in response to the 2002 McNally Fire on Sequoia National Forest. Surveys of echolocation activity were conducted one year post fire stratified in riparian, upland habitat, and mixed conifer forest habitat spanning three levels of burn severity (unburned, moderate and high). Results from this study in mixed conifer forests found no significant negative effects of fire on bat activity. The fringed myotis bat demonstrated increasing magnitude of activity response with burn severity, and the pallid bat showed a positive threshold response to fire (no differentiation of fire severity but positive fire response). The study found no significant negative effects of fire on bat activity in mixed conifer forests with this large and severe wildfire, supporting the view that bat communities are resilient to fire and that fire may enhance foraging opportunities. The study also suggested that factors that drive use of forest habitats (e.g. foraging opportunity, prey species) were functionally equivalent post fire to landscapes with mixed-severity fire.

CUMULATIVE EFFECTS

California Condor

The CE analysis area for each species varies and was based on its anticipated home range extent and other factors. In the case of the California condor and its ability to traverse much of the Forest in a day, the CE boundary for the assessment of cumulative effects was defined as essential habitat which overlaps the Forest which includes a total of 129,680 acres. Table 64 displays the total suitable habitat available on Forest Service land and private property within the cumulative effects analysis area, and the acres of treatment proposed as part of the Tobias Project.

Table 64. Species specific cumulative effects (CE) analysis area in acres, and suitable habitat for the California condor.

CE Analysis Area of Consideration and Total Estimated Acres	Acres of Suitable Species Habitat on Forest Service Lands	Acres of Suitable Habitat within Private Inholdings	Total Acres of Suitable Habitat in Defined CE Analysis Area	Suitable Habitat within Proposed Tobias Treatment areas
Essential habitat overlapping Sequoia National Forest, 129,680 Acres	122,360	7,320	129,680	2,904

<u>Summary of Forest Service and Private Land Actions and Cumulative Effects to Condor Essential Habitat</u>

The Tobias Project action alternatives in light of past, present, and reasonably foreseeable actions are not anticipated to negatively influence the California condor or its essential habitat. Table 65 provides an acreage summary of these actions within National Forest system lands[13] and known THPs filed on private inholdings within the condor essential habitat cumulative effects analysis area (See BE for detailed discussion).

Alternative 2 or 3 would treat approximately 2,904 acres of essential habitat in the project area. Prior commercial harvest or fuels reduction projects on Forest Service system lands since the last mapping update (2007), along with the proposed Tobias Project Action Alternatives, collectively encompasses approximately 11% of the available essential habitat on the Forest for the California condor (Table 65). Silvicultural prescriptions for previous projects on Forest Service System Lands were crafted under the Giant Sequoia National Monument, the CASPO EA (USDA 1993), or the SNFPA FEIS or SFEIS (USDA 2001). Therefore, specific standards and guidelines were incorporated to retain all large live trees and snags (30” dbh and greater) unless deemed a safety hazard, and to retain an adequate recruitment pool of mid-sized trees to provide for their replacement overtime. Some minor decreases in canopy cover are anticipated with thinning and fuel reduction work; however, these decreases are not anticipated to preclude use of existing habitat. Prior actions on Non-Forest Service Lands are anticipated to have minimal influence on individuals or their habitats.

[13] Actions considered include those that have occurred since the last forest mapping update (2007), except projects under injunction. These projects have been brought forward in the cumulative effects analysis.

Table 65. Acreage summary of past, present and foreseeable actions within National Forest system lands and THPs filed on State or private land within the California condor essential habitat cumulative effects analysis area.

Land base	Existing Acres of Essential Habitat	Past/present Acres of Commercial Thin and fuels Treatments	Past/present Acres of Non-commercial thin and fuels treatment	Acres of Habitat affected by Tobias Action Alternatives	Total Essential Habitat Acres effected from past, present and reasonably foreseeable project
N.F.	122,360	4,794	10,923	2,904	18,620
Non-N.F.	7,320	431	0	0	431
N.F. & Non-FS	129, 680	5,225	10,923	2,904	19,051

Actions identified on private land occur in areas where residences or other improvements exist. As such, they provide little suitable habitat for the condor and, given their limited scope and distribution across the landscape, contribute little negative influence.

Essential habitat overlaps with portions of 14 cattle grazing allotments. Livestock grazing has been an ongoing activity prior to the establishment of Sequoia National Forest, and is presently at substantially lower levels than what historically occurred. Grazing use adheres to Forest standards and guidelines that are monitored annually for compliance. The presence of livestock in areas of essential habitat may have beneficial consequences for the condor. Livestock occasionally die through predation or natural causes and therefore can provide an incidental food resource. Past formal consultation with the USFWS for re-authorization of livestock grazing permits on five allotments in the Greenhorn Mountains was completed in 2007. The USFWS concurred with the biologist's opinion of "No Effect." The remaining grazing permits follow similar guidelines for resource protection; therefore, livestock grazing at current levels is not anticipated to result in measurable impacts to the condor or its habitat.

Little to no impacts to this species is anticipated under existing recreation uses and the current OHV policy. Condor use is occurring at existing visitor use levels and therefore is not a significant factor from a cumulative effects perspective.

CUMULATIVE EFFECTS - FOREST SERVICE SENSITIVE SPECIES

Defining Cumulative Effect Analysis Area - The CE analysis area chosen for each species varied based on estimated home range extent. Table 66 displays the total estimated acres for the CE area, estimated acres of suitable habitat found on Forest Service and private lands, estimated acres for past, present, and reasonably foreseeable vegetation projects that have occurred since last vegetation update, and proposed acres of suitable habitat treated within the Tobias Project.

Table 66. Species specific cumulative effects (CE) analysis area in acres, and suitable habitat.

Species Name	CE Analysis Area of Consideration and Total Estimated Acres	Suitable Habitat on Forest Service Lands	Suitable Habitat within Private Inholdings	Total Suitable Habitat in Defined CE Analysis Area	Suitable Habitat Proposed for Treatment in the Tobias Project
California Spotted Owl	Includes Tobias Project Analysis Area plus a 1.5 mile radius buffer from the boundary. Total CE Analysis Area estimated at 34,778 Acres.	12,644	462	13,106	1,502
Northern Goshawk		12695	472	13,167	1,502
Marten	Includes Tobias Project Analysis Area plus a 0.2 mile radius buffer from the boundary. Total CE Analysis Area estimated at 13,923	2,930	73	3003	1,502
Bat Species	Tobias Project Analysis Area, 11,120 Acres	10,898	222	11,120	4,889

Summary of Forest Service and Private Land Actions - Table 67 summarizes past, present, and foreseeable vegetation/fuel reduction projects, treated acres as proposed for the Tobias Project, and the total acres affected for each CE area by species.

Table 67 Past, present and reasonably foreseeable projects that overlap with the CE analysis area identified by species.

Total Cumulative Effects (CE) Analysis Area and Acres by Species		Acres of Suitable Habitat in CE Analysis Area	Past/Current Commercial Thin & Associated prescribed fuels treatment in Suitable Habitat	Past /Current Non-commercial Thin and prescribed fuels treatment in Suitable Habitat	Acres of Suitable Habitat Affected by Tobias Action Alternatives	Total Suitable Habitat Acres Affected by Past, Present, and Foreseeable Actions and Total Percent of CE Analysis Area
California Spotted Owl Includes 1.5 mile radius from Tobias boundary 34,778 Acres	**N . F .**	12,644	445	747	1,502	2,694
	Private	462	78	0	N/A	78
Total		13,106	523	747	1502	2,772 (21%)
Northern Goshawk Includes 1.5 mile radius from Tobias boundary 34,778 Acres	**N . F .**	12,695	445	747	1502	2,694
	Private	472	78	0	N/A	78
Total		13,167	523	747	1502	2,772 (21%)
American Marten Includes 0.2 Mile Radius from 13,923	**N . F .**	2,930	15	0	1502	1,517

Total Cumulative Effects (CE) Analysis Area and Acres by Species		Acres of Suitable Habitat in CE Analysis Area	Past/Current Commercial Thin & Associated prescribed fuels treatment in Suitable Habitat	Past /Current Non-commercial Thin and prescribed fuels treatment in Suitable Habitat	Acres of Suitable Habitat Affected by Tobias Action Alternatives	Total Suitable Habitat Acres Affected by Past, Present, and Foreseeable Actions and Total Percent of CE Analysis Area
	Private	73	5	0	0	5
Total		3,003	18	0	1502	1522 (50%)
N.F. = National Forest, Pv't = Private Land, N/A= not applicable private land.						

Other Forest Service Actions and Activities.

Fire History: Since the McNally Fire 0f 2002 no further wildfires have occurred within any of the cumulative effects analysis areas established for the species addressed.

Recreational Activity: Recreation activities are similar within each CE analysis areas, and are generally tied to road and trail related activities such as hiking, equestrian, off highway vehicle or over the snow vehicle (OHV/OSV) uses and hunting.

Livestock Grazing: The majority of the established cumulative effect analysis areas allow for livestock grazing under permit.

Alternatives 2 and 3 - Dirct and Indirect Cumulatiave Effects:

California Spotted Owl and northern goshawk: No additional past, present or reasonably forseeable vegetation or fuels reduction actions were identified within the Tobias Project Analysis Area. Within a broader 1.5 mile radius buffer surrounding the project boundary, past, present, and reasonably foreseeable actions discussed were not found to represent a substantial cumulative effect to either the California spotted owl, the goshawk, or their habitats. Based on Table 26 and 27 in the Biological Evaluation limited reductions in desirable stand elements are anticpated to occur. The majority of identified actions do not occur within a 0.7 mile radius distance of the Tobias owl pair. Those that do occur, are limited to pre-commercial thinning of small trees. As such these actions are not expected significantly lower habitat quality. Approximately 45 acres of commercial harvest are proposed outside of the 0.7 mile radius buffer established as the core area for the Tobias spotted owl pair. Therefore this proposed action will have no appreciative impact on core habitat. The commercial entry would lie within the 1.5 mile buffer from the spotted owl activity center (home range scale), but habitat is anticipated to remain foraging quality should the court injunction ever be lifted.

Past surveys have not detected northern goshawks in the Tobias project area, and no goshawk PACs have been delineated within the project area or the larger cumulative effect analysis area. Post implementation of the Tobias project and other anticipated actions would retain habitat in suitable capability for incidental use. Silvicultural prescriptions for projects on Forest Service System Lands were crafted under the CASPO EA or SNFPA (USDA 2001 and 2004). Therefore, specific standards and guidelines have been incorporated to retain all large live trees and snags (30” dbh and greater), unless deemed a safety hazard. Measures also place emphasis on retaining a sufficient recruitment pool of mid sized trees to provide for their replacement overtime. Some minor decreases in canopy cover are anticipated with forest thinning, however, these decreases are not anticipated to preclude owl or goshawk use. The additional proposed treatments are anticipated to aid in the ability to protect habitat under wildfire events, thereby retaining the greatest set of habitat attributes over time.

Marten: Current survey information from a variety of sources has not detected marten on the east side of the Greenhorn Mountains. This included surveys completed by the SNFPA Long Term Regional Monitoring program for forest carnivores, and additional surveys conducted by District personnel. Low rates of detection in the southeren extent of Tulare County have been previously noted in research literature. If marten do occur it is speculated that any use in the project area would be incidental in nature. Implementation of either action alternative is not expected to increase habitat fragmentation in forested stands or to render habitat unsuitable.

Therefore, habitat availability as it exists will remain in its current distribution and relative quality. Improvements to increase growth on small trees in recovering stands planted since the Stormy Fire would improve forest continuity over the long term. Silvicultural and prescribed burn prescriptions do not use clear cut methods and should maintain stands with sufficient forest cover and large physical structures important for rest/den and foraging activity. Appropriate limited operating periods (LOPs) have been incorporated to reduce the potential conflicts during the reproductive season. Therefore, the Tobias action alternatives in light of past, present, and reasonable foreseeable actions would not result in negative influences to individuals or their habitats.

The CE area overlaps with portions of several cattle grazing allotments. Livestock grazing has been an ongoing activity prior to the establishment of Sequoia National Forest, and is presently at substantially lower levels than what historically occurred. Improved management of the grazing program has led to the establishment of allotment specific standards and guidelines to maintain habitat quality for sensitive area such as riparian areas and meadows. Standards and guidelines along with best management practices specify requirements to provide for resource protection, and use of appropriate utilization standards to maintain adequate forage and shrub cover for prey species.

No additional wildfires have impacted late successional habitats within the project area or larger cumulative effect analysis area since the last mapping update.

Limited background levels of recreation activities occur (hunting, fishing and OHV/OSV) but are limited in scope, distribution and duration. No new campground facilities or roads have been identified.

DETERMINATION

This Biological Evaluation analyzes the potential effects of the proposed Tobias Project on Forest Service sensitive species. Providing proposed treatments are carried out with proper implementation of stated design features, best management practices, and the use of Sequoia National Forest riparian conservation objectives, the following determination findings are rendered for Alternatives 1, 2 and 3.

Region 5 Forest Service Sensitive Species: California spotted owl, northern goshawk, marten, Townsend's big-eared bat, pallid bat and fringed myotis bat:

Alternative 1: It is my determination that implementation of Alternative 1 of the Tobias Project will have "No Impact" on the species addressed.

- The analysis modeled the impact of a potential wildfire event to show changes in vegetation over time; however, there is no guarantee an unplanned wildfire will occur. Thus doing no project would result in no alteration in current condition or habitat distribution. **Alternative 2 and 3:** It is my determination that the Tobias Project "may impact individuals, but is unlikely to result in a trend toward Federal listing or loss of viability for the California spotted owl, northern goshawk, marten, Townsend's big-eared bat, pallid bat and fringed myotis bat".

- Speicific project design standards and guidelines including those in the 2004 SNFPA, Forest riparian conservation standards, and Best Management Practices will be implemented. These provisions provide for species protection during critical time frames of the reproductive cycle through use of limited operating periods. Provisions also limit impacts to important riparian and meadow environments, as well as, fine scale structural components used in forests, such as large, live trees, snags and down woody debris that are most at risk and difficult to replace.

- Action alternatives present some risk to forest interior species such as the California spotted owl in particular. Post implementation, decreases in canopy cover may occur in some CHWR types; lowering habitat quality. These effects at the PAC, HRCA and 0.7 mile scales have the greatest potential to result in changes in site occupancy and to produce fluctuations in reproductive success. Research has evaluated wildfire effects on spotted owl occupancy and its habitat. Findings suggest that spotted owls have high site fidelity and often remain in their territories despite moderate habitat loss, and negative changes to canopy cover that are greater than those predicted to occur here. Therefore, it is anticipated that while there could be some habitat shifts in quality, overall forest conditions would likely allow for continued occupation. Should loss of the owl pair occur, it is not anticipated to result in a substantial decline in species viability nor contribute to a downward trend, given the number of owl pairs currently found on the Forest.

- Thinning and fuels reduction work will be completed using provisions in North et al. (2009) which provide for greater forest heterogenity by maintaing a mix of both open and dense canopy forests based on topographic features. These conditions are anticipated retain habitat in a suitable condition while reducing the risk and effects of stand replacing wildfires. Actions are anticipated to promote better forest continuity across the landscape in the southern Sierra Nevada over the long term. Proposed actions are anticpated to improve site conditions for growing young stands previously impacted by the Stormy Fire. This will increase growth and development of residual trees and forest representation across the landscape in the long term.

FISHER (*PEKANIA PENNANTI*)

The following analysis will examine the potential direct and indirect effects to fishers and their suitable habitat by implementing the proposed action alternatives (Alternatives 2 and 3) with and without wildfire and compare them to the potential effects of the No Action Alternative with and without wildfire. When running the FVS model in the Tobias Project Area, treatment scenarios occurred in 2024 (Alternative 2 and Alternative 3) and wildfire scenarios occurred in 2034 (No Action Alternative, Alternative 2, and Alternative 3).

The Conservation Biology Institute (Spencer et al. 2008) modeling of fuels reduction projects and wildfire effects on the fisher examined moderate fire behavior and a more severe projection of wildfire behavior as a result of projected climate change. These severe fire effects pose a significant challenge to the persistence of fisher in the southern Sierra Nevada. The FVS with the Fire and Fuels Extension analyzed the effectiveness of proposed fire and fuel vegetation management treatments and potential fire effects on short- and long-term (50 years) stand dynamics. 2010 stand exams and Remote Area Weather Sensor (RAWS) Moderate wildfire weather (90th percentile) were used to model wildfire effects. Weather and fuel moisture for prescribed fire were derived from local burn plans.

The following four criteria, with supporting rationale, have been selected for the evaluation of effects for this analysis:

Change in California Wildlife Habitat Relationships (CWHR 2.1) Habitat: CWHR 2.1 is a surrogate for identifying moderate to high suitability habitat as described in the Fisher Biological Evaluation. We have selected CWHR 2.1 as a surrogate for identifying moderate to high suitability habitat as previously described. The southern Sierra subpopulation located on Sequoia National Forest has been documented to support fisher at the highest density, exhibits the smallest fisher home ranges found in North America (Spencer, et al., 2008), and remains with the highest naïve occupancy rate detected through long term fisher monitoring conducted in Region 5. Habitat suitability is evaluated at the following scale: **Treatment unit:** Changes in quality, quantity and distribution of available habitat can affect fisher foraging; reproduction; and movements (daily, breeding-season, and dispersal), altering individual energetics.

Changes in availability of intermediate and large trees for resting and denning structures: The availability of suitable intermediate (11-24"dbh) and large (>24"dbh) trees and snags to serve as resting and denning structures is thought to be a limiting factor across the environment. It is therefore important to ensure that sufficient structures remain across the landscape so that fisher movement and reproduction is not disrupted, which could lead to increased energetic expense or a decrease in reproductive rate.

Habitat connectivity: Habitat adjacent to the Tobias Project area has been severely fragmented and isolated by past large fires and logging activities. Fragmentation of habitat may lead to decreased dispersal ability of fishers and isolation. Dispersal has profound implications to mammalian population structure, affecting the ability to colonize vacant habitat, home range spacing patterns, and local genetics. In small, isolated populations such as the Southern Sierra fisher, fragmentation can lead to extirpation.

Effects of wildfire on fisher habitat: It is important to analyze the short-term effects of fuels reduction across a planning area compared to the long-term effects of catastrophic fire in the absence of fuels reduction treatments. The long term consequences of uncharacteristically severe wildfire have the potential to eliminate large contiguous acreages of habitat, further fragmenting this isolated Southern Sierra fisher population.

ENVIRONMENTAL CONSEQUENCES

The following information describes in detail how each criteria is analyzed specific to the Tobias Project. The indirect and direct effects for each criteria is analyzed by alternative.

Change in California Wildlife Habitat Relationships (CWHR 2.1) Habitat by Treatment Unit

Existing acres of CWHR vegetation type were determined using a GIS layer published by the USDA Forest Service, Pacific Southwest Region Remote Sensing Lab. Treatment acres relative to existing vegetation were based on mapping, field visits and stand exams conducted in 2010 by Forest Service Staff. These field visits refined the base vegetation layer, corrected habitat types as needed and refined the net acres of treatment. Data collected in stand exams were entered into the most current version of the FVS with the Fire and Fuels extension, to model existing stand conditions, and project growth, mortality and fire effects into the future under the three alternatives. Simulation modeling is a process of analyzing existing environmental conditions, including fuel loads, to provide information when comparing the relative risks of no action versus the action alternatives (Thompson et al, 2011).

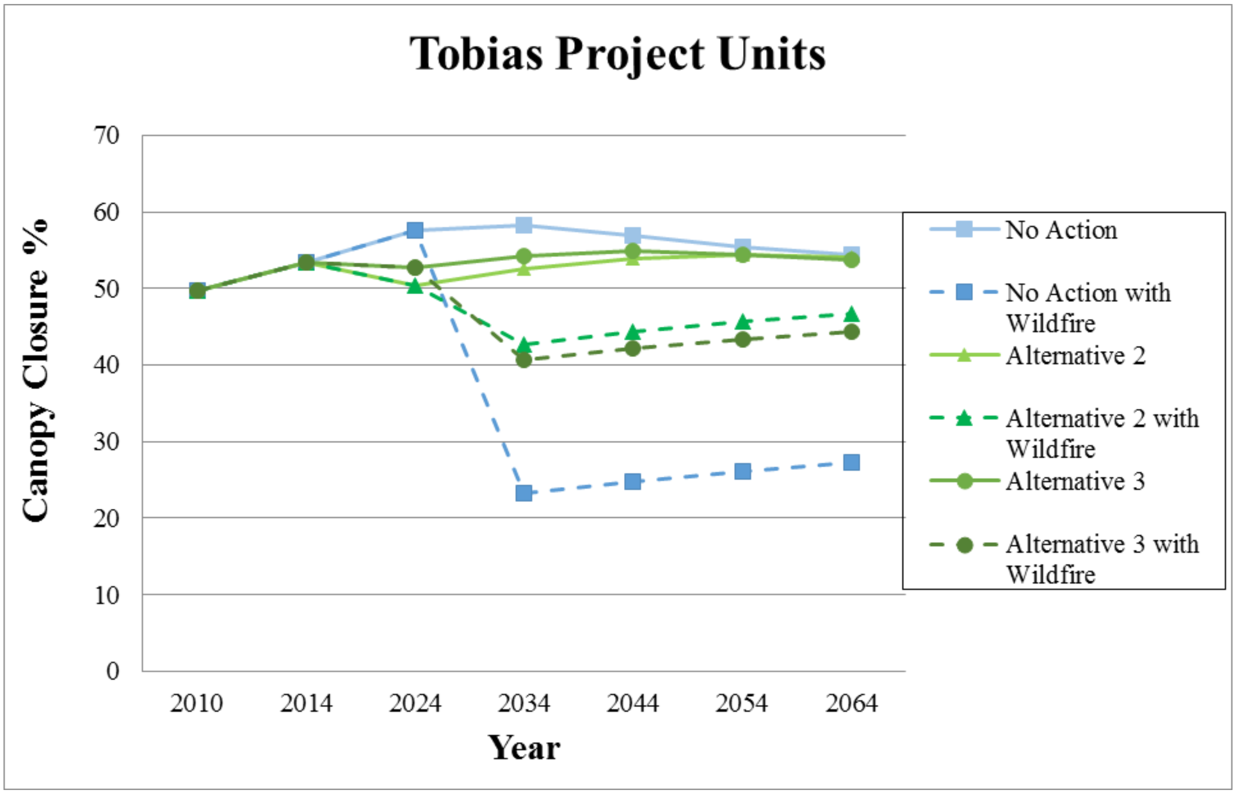
Alternative 1: NO ACTION

Direct and Indirect Effects

Under the No Action Alternative, no vegetation management activities would occur in the Tobias Project area, therefore there would be no direct effect to fisher habitat quality, quantity, or distribution. Acres of moderate to high quality fisher habitat (as defined by CWHR 2.1) and CWHR 2.1 fisher habitat scores would remain at current values. Based on FVS model predictions, the amount of moderate and high quality fisher habitat in the project area would increase from 1,860 to 2,069 acres in ten years. The available habitat to fisher for foraging, reproduction, and movements will not change; therefore the Frog Project Area will remain in moderately suitable habitat condition for fisher.

There may be indirect negative effects to fisher and their habitat if Alternative 1 is selected.   No vegetation management activities would occur to lower tree density and the continued threat of uncharacteristically severe wildfire would remain, and may increase. Density related mortality of trees would be expected to increase over time. FVS modeling predicts an increase in canopy closure over the next 20 years, followed by a gradual decline (Figure 44). Failing to make an attempt at adjusting stand density to more natural levels, would predispose trees to episodes of drought stress and subsequent insect and disease mortality. Maintaining stands with elevated levels of small and intermediate trees will continue to slow development of larger trees, a recognized limiting factor throughout the project area. Furthermore, given the predicted trend noted by many scientists regarding a shift in climate conditions reflecting environments with warmer and drier regimes in the Western United States (McKenzie, et al., 2004) would compound these effects.

Figure 44. Average canopy closure projected to year 2064 under the No Action Alternative, No Action with Wildfire, Alternative 2, Alternative 2 with Wildfire, Alternative 3 and Alternative 3 with Wildfire



Uncharacteristically severe wildfires pose one of the greatest threats to fisher habitat in the Southern Sierras (Lofroth, et al., 2010). If a wildfire of this nature were to occur in the Tobias Project area, existing acreage of moderate to high quality fisher habitat could be lost (Table 68), CWHR 2.1 fisher habitat scores would decrease (Table 69), and canopy closure would change dramatically for a longer duration compared to thinning in either the Proposed Action or Alternative 3 (Figure 44). Large areas of currently suitable habitat may become unusable. Fisher may become more isolated and be required to travel longer distances to meet foraging and reproduction needs, resulting in higher energetic costs, and greater risk for predation.

Table 68. No Action Alternative: Pre- to Post-Wildfire changes in acres of moderate to high quality fisher habitat as a result of simulated wildfire modeled in 2034 within the Tobias Project Area, Western Divide Ranger District, Sequoia National Forest.

		Total Acres	PROJECTED CWHR 2.1 Pre-Project Acres in 2034								Total Ac Mod-Hi	PROJECTED CWH		
Stand	Forest Type	Total Acres	4P	4M	4D	5S	5P	5M	5D	6	Pre-Project	4P	4M	4D
4	Jeffrey Pine	12			12						12			
	Montane Hardwood	1			1						1			
8	White Fir	11		3	2		6				11			
	Jeffrey Pine	51			51						51			
	Sierran Mixed Conifer	6		5	1						6		5	
9	Jeffrey Pine	1			1						1			
	Sierran Mixed Conifer	3	>1		3						3			
12	Sierran Mixed Conifer	1		>1	>1						1		>1	
13	Sierran Mixed Conifer	110		12	96			2			110		12	
	Jeffrey Pine	2			2						2			
	White Fir	15		6		5		4			15			
14	Jeffrey Pine	6		>1	6						6			
	White Fir	3			1			2			3			
16	Sierran Mixed Conifer	2		2							2		1	
	White Fir	75		>1	53		3	14	5		75			
20	Sierran Mixed Conifer	7		7	1						7		7	
	White Fir	4						4			4			
21	Sierran Mixed Conifer	87		72	15						87		47	
	White Fir	2			2			>1			2			
22	Jeffrey Pine	4			4						4			
	Sierran Mixed Conifer	74		65	9						74		55	
	White Fir	75		8	11			54	1		75			
23	Sierran Mixed Conifer	13		6	7						13		6	
	White Fir	122		1	58			8	54		122	1		
24	Jeffrey Pine	8			1			6			8			
	Sierran Mixed Conifer	11	5	>1				6			11		>1	
	White Fir	66		31	8			28			66			
25	Sierran Mixed Conifer	99	12	2	34			52			99		2	
	White Fir	77			25			32	19		77			
27	Sierran Mixed Conifer	122		29	91			1			122		29	
29	Jeffrey Pine	27			27						27			
	White Fir	142		8	4	>1	1	18	110		142	2		
30	Jeffrey Pine	53			53						53			

	Sierran Mixed Conifer	114	1	25	87			1			114		25	
	White Fir	158		19	27	>1		55	58		158			
31	Jeffrey Pine	31			31						31			
	Sierran Mixed Conifer	28		1	27						28			
	White Fir	193		1	35	8	1	49	99		193	1		
32	Sierran Mixed Conifer	2		1	1						2		1	
	White Fir	5			5						5			
33	Jeffrey Pine	3			3						3			
	White Fir	42		1	25		6	10			42			
34	Sierra Mixed Conifer	3		3							3		3	
	White Fir	31			13		>1	15	3		31			
36	Sierra Mixed Conifer	114		112	2						114		112	
37	Sierra Mixed Conifer	11		11				>1			11		11	
38	Sierra Mixed Conifer	68		48	20						68		47	
40	Jeffrey Pine	0			<1						0			
	Sierran Mixed Conifer	14		4	7			4			14		3	
Project Area Total		2108	18	483	861	13	17	366	349	0	2069	4	366	0

Table 69. Project analysis area based changes in CWHR 2.1 habitat scores within the Tobias Project area. Habitat as modeled in the Forest Vegetation Simulator (FVS) with treatments occurring in 2024 for Action Alternatives 2 and 3, and Wildfire occurring in 2034 for No Action and Action Alternatives 2 and 3.

	No Action With Two Decades of Growth	No Action with Wildfire Modeled to Occur in 2034	Action Alternative 2 With Two Decades of Growth	Action Alternative 2 With Wildfire Modeled to Occur in 2034	Action Alternativ With Two Decades Growth
Weighted[a] Fisher Habitat Score	0.833	0.333	0.764	0.611	0.781

Table 70. Project analysis area based changes in CWHR 2.1 habitat scores within the Tobias Project area. Habitat as modeled in the Forest Vegetation Simulator (FVS) with thinning occurring in 2024 for Action Alternatives 2 and 3.

	No Action With One Decade of Growth	Action Alternative 2 With One Decade of Growth	Action Alternative 3 With One Decade of Growth
Weighted[a] Fisher Habitat Score	0.822	0.764	0.779

Alternative 2:

Direct Effects

Alternative 2 would remove trees and brush for specific restoration or fuels reduction objectives as described earlier in this document. Through CWHR habitat analysis, changes through the implementation of Alternative 2 are predicted to occur in 18 of the 24 stands that have suitable fisher habitat treated (Table 71). CWHR density class changes from D to M are limited to 577 acres in the Tobias Project Area if Alternative 2 is implemented (Table 71).

Overall, the implementation of Alternative 2 would reduce the total CWHR 2.1 habitat score from 0.82 to 0.76 in the short-term (Table 70). Therefore, the quality of the habitat for fisher would decline slightly post treatment, but all the acres would remain in the moderate-high suitability category based on the model.

Figure 3 indicates that there is a projected short-term drop in canopy closure to 50 percent as a result of thinning. However, canopy closure is projected to recover within 10 years following treatments.

These changes to habitat may result in short term effects in the way fisher utilize the habitat. Fisher may leave treatment units during project implementation, and will likely rely more heavily on other areas of their home range. Recent studies (Garner 2013 and Zielinski et al 2013) have shown that fishers appear to tolerate some degree of fuel-reduction or restoration vegetation treatments in their home ranges, despite their short-term and localized effects. In a study area north of the Kings River, Garner (2013) found that although fishers avoid using areas treated for fuel reduction (including mechanical thinning and prescribed fire), their home ranges tend to include larger proportions of treated areas than in the landscape as a whole, and they do not shift home ranges in response to treatments. Garner (2013) concluded that treatments did not render the habitat unsuitable and may, in fact, increase fire resiliency, provided management focuses on surface and ladder fuels. Individual energetic expenses may be increased if fishers have to travel farther to forage, however with areas of adjacent suitable habitat within their home range; it is unlikely this would result in individual mortality. A slight decline in individual fitness is possible, mostly occurring during the period of active vegetation management.

Indirect Effects

The proposed thinning will maximize tree growth and accelerate development of larger trees in the project area. However, the desire to promote more rapid development of larger trees is moderated by the need to retain higher canopy closure and basal area in the short-term for fisher.

Based on FVS and fire modeling runs, if a wildfire were to occur under the No Action Alternative, only 757 of 2,108 acres would remain in moderate to highly suitable habitat and the total weighted CWHR 2.1 habitat suitability would decrease from 0.83 to 0.33 (Tables 68 and 69).

Table 71. Alternative 2: Pre- to Post-Project changes in acres of moderate to high quality fisher habitat as a result of Action Alternative 2 vegetation treatments in the Tobias Project Area, Western Divide Ranger District, Sequoia National Forest modeled in 2024.

		Total Acres	PROJECTED CWHR 2.1 Pre-Project Acres in 2024								Total Ac Mod-Hi	PROJECTED CWHR 2.1 Post-Project Acres in 2024								Total Ac Mod-Hi
Stand	Forest Type	Total Acres	4P	4M	4D	5S	5P	5M	5D	6	Pre-Project	4P	4M	4D	5S	5P	5M	5D	6	Post-Project
4	Jeffrey Pine	12		12							12		12							12
	Montane Hardwood	1			1						1			1						1
8	White Fir	11		3	2		6				11		3	2		6				11
	Jeffrey Pine	51		>1	51						51		46	5						51
	Sierran Mixed Conifer	9		5	4						9	3	5	1						9
9	Jeffrey Pine	1			1						1		1							1
	Sierran Mixed Conifer	3			3						3	>1	>1	2						3
12	Sierran Mixed Conifer	1		>1	>1						1		1							1
13	Sierran Mixed Conifer	110	5	7	96			2			110	5	89	14			2			110
	Jeffrey Pine	2		2	1						2		2							2
	White Fir	15		6		5		4			15		6		5		4			15
14	Jeffrey Pine	6			6						6			6						6
	White Fir	3			1			2			3			1			2			3
16	Sierran Mixed Conifer	2		2							2		2							2
	White Fir	75		>0	53		3	14	5		75		29	23		3	14	5		75
20	Sierran Mixed Conifer	7		7	1						7		7	>1						7
	White Fir	4						4			4						4			4
21	Sierran Mixed Conifer	87		72	15						87	>1	81	6						87
	White Fir	2			2			>1			2		1	2			>1			2
22	Jeffrey Pine	4			4						4		4							4

	Sierran Mixed Conifer	74		65	9						74		74							74
	White Fir	75		8	11			54	1		75		19	1			54	1		75
23	Sierran Mixed Conifer	13		6	7						13		13	>1						13
	White Fir	122		1	58			8	54		122	1	52	7			8	54		122
24	Jeffrey Pine	8			1			6			8		1				6			8
	Sierran Mixed Conifer	6		>1				6			6		>1				6			6
	White Fir	66		31	8			28			66		37	1			28			66
25	Sierran Mixed Conifer	91	4	2	34			52			91	4	27	8			52			91
	White Fir	77			25			32	19		77		17	8			32	19		77
27	Sierran Mixed Conifer	119	27	3	89			1			119	27	78	13			1			119
29	Jeffrey Pine	27		8	20						27		27							27
	White Fir	142		8	4	>1	1	18	110		142	2	8	3	0	1	18	110		142
30	Jeffrey Pine	53		27	26						53		53	>1						53
	Sierran Mixed Conifer	118	16	9	92			1			118	23	72	23			1			118
	White Fir	158		19	27	>0		55	58		158		30	15	>1		55	58		158
31	Jeffrey Pine	27		14	13						27		17	10						27
	Sierran Mixed Conifer	27		1	26						27		20	7						27
	White Fir	193		1	35	8	1	49	99		193	1	25	11	8	>1	49	99		193
32	Sierran Mixed Conifer	2		1	1						2		1	1						2
	White Fir	5			5						5			5						5
33	Jeffrey Pine	3		3	>1						3		3							3
	White Fir	42		1	25		6	10			42		9	18		6	10			42
34	Sierra Mixed Conifer	3		3							3		3							3
	White Fir	31			13		>1	15	3		31		11	2			15	3		31
36	Sierra Mixed Conifer	114		112	2						114		114	1						114

37	Sierra Mixed Conifer	**11**		**11**				**>1**			**11**		**11**			**>1**				**11**
38	Sierra Mixed Conifer	**48**		**48**							**48**		**48**							**48**
40	Jeffrey Pine	**0**		**>1**							**0**		**>1**							**0**
	Sierran Mixed Conifer	**9**		**3**	**1**			**4**			**9**	**1**	**3**				**4**			**9**
Project Area Total		**2069**	**50**	**499**	**772**	**13**	**17**	**367**	**349**	**0**	**2069**	**66**	**1060**	**195**	**13**	**17**	**367**	**349**	**0**	**2069**

[a]All acres are derived in GIS and are approximate; therefore they are rounded to the nearest whole number. Total acres may vary due to rounding.

In comparison, if a wildfire were to occur post implementation of Alternative 2, the total weighted CWHR 2.1 habitat suitability score would only decrease to 0.61 (Table 69). Therefore, more suitable habitat for fisher would be retained if a wildfire were to occur in the project area post treatment than if a wildfire were to occur in the project area left untreated. The FVS model demonstrated that if a wildfire occurred following treatment in Alternative 2, canopy closure would drop to 43 percent and would recover slowly over time reaching 47 percent thirty years after the fire (Figure 43). In contrast, if a wildfire were to occur under the No Action Alternative, canopy closure would drop to 23 percent (CWHR density class S), and although it is projected to increase over time, closure would recover more slowly and only reach 27 percent (CWHR density class P) in thirty years (Figure 43).

Alternative 3:

Direct Effects

Alternative 3 proposes hand-thinning on 1,723 acres, mastication or hand-thinning on an additional 3,150 acres, and understory burning on 447 acres but no commercial tree harvest. Only trees 8 inches in diameter and less would be cut in this alternative. The same roads are proposed for decommissioning as in Alternative 2.

Through CWHR habitat analysis and FVS modeling, no loss of acres considered moderate to high quality fisher habitat are predicted to occur following treatments (Table 72). The CWHR fisher habitat score would be slightly lower (0.78) than in the No Action Alternative (0.82) (Table 70).

Implementation of Alternative 3 differs from Alternative 2 in that it is expected to result in slower development of a large tree component over time, because it maintains more medium sized trees, which would compete for limited nutrients and water resources. Thinning small trees and prescribed burning would also reduce near ground cover, which may be important to fisher for travel and foraging purposes.

Figure 3 displays the anticipated changes in canopy cover following vegetation treatments. It also displays the anticipated trend in recovery over time based on growth projections. In Alternative 3, canopy closure would decrease slightly post treatment (about one percent compared to No Action), then recover (Figure 43). Post treatment canopy closure values in Alternative 3 would be higher than those anticipated under Alternative 2 for the first 40 years following treatments.

Indirect Effects

The long-term positive effects of thinning (due to the reduction of competition for light, nutrients, water, and less risk from drought or disease) would be less with this alternative in comparison to Alternative 2, but still provide some benefits.

Indirect effects of canopy cover reduction through the removal of small size class trees may provide a more open understory and reduced escape cover in treated portions of the project area. These conditions may slightly increase the potential for predation of fisher by mountain lion, bobcat, or coyote. The potential for habitat disturbance in the project area from thinning and prescribed fire treatments as discussed under Alternative 2, while similar, would be less in Alternative 3 since large diameter trees would be left untreated.

Table 72. Alternative 3: Pre- to Post-Project changes in acres of moderate to high quality fisher habitat as a result of Action Alternative 3 vegetation manipulation in the Tobias Project Area, Western Divide Ranger District, Sequoia National Forest modeled in 2024.

		Acres	PROJECTED CWHR 2.1 Pre-Project Acres in 2024								Total Ac Mod-Hi	PROJECTED CWHR 2.1 Post-Project Acres in 2024								Total Ac Mod-Hi
Stand	Forest Type	Acres	4P	4M	4D	5S	5P	5M	5D	6	Pre-Project	4P	4M	4D	5S	5P	5M	5D	6	Post-Project
4	Jeffrey Pine	12		12							12		12							12
	Montane Hardwood	1			1						1			1						1
8	White Fir	11		3	2		6				11		3	2		6				11
	Jeffrey Pine	51		>1	51						51		46	5						51
	Sierran Mixed Conifer	9		5	4						9	3	5	1						9
9	Jeffrey Pine	1			1						1		1							1
	Sierran Mixed Conifer	3			3						3	>1	>1	2						3
12	Sierran Mixed Conifer	1		>1	>1						1		1							1
13	Sierran Mixed Conifer	110	5	7	96			2			110	5	89	14			2			110
	Jeffrey Pine	2		2	1						2		2							2
	White Fir	15		6		5		4			15		6		5		4			15
14	Jeffrey Pine	6			6						6			6						6
	White Fir	3			1			2			3			1			2			3
16	Sierran Mixed Conifer	2		2							2		2							2
	White Fir	75		>0	53		3	14	5		75		>1	53		3	14	5		75

20	Sierran Mixed Conifer	7		7	1						7		7	>1						7
	White Fir	4						4			4						4			4
21	Sierran Mixed Conifer	87		72	15						87	>1	81	6						87
	White Fir	2			2			>1			2		1	2			>1			2
22	Jeffrey Pine	4			4						4		4							4
	Sierran Mixed Conifer	74		65	9						74		74							74
	White Fir	75		8	11			54	1		75		8	11			54	1		75
23	Sierran Mixed Conifer	13		6	7						13		13	>1						13
	White Fir	122		1	58			8	54		122		1	58			8	54		122
24	Jeffrey Pine	8			1			6			8		1				6			8
	Sierran Mixed Conifer	6		>1				6			6		>1				6			6
	White Fir	66		31	8			28			66		31	8			28			66
25	Sierran Mixed Conifer	91	4	2	34			52			91	4	27	8			52			91
	White Fir	77			25			32	19		77			25			32	19		77
27	Sierran Mixed Conifer	119	27	3	89			1			119	27	78	13			1			119
29	Jeffrey Pine	27		8	20						27		27							27
	White Fir	142		8	4	>1	1	18	110		142	0	8	4	0	1	18	110		142
30	Jeffrey Pine	53		27	26						53		53	>1						53
	Sierran Mixed Conifer	118	16	9	92			1			118	23	72	23			1			118
	White Fir	158		19	27	>0		55	58		158		30	15	>1		55	58		158
31	Jeffrey Pine	27		14	13						27		17	10						27
	Sierran Mixed Conifer	27		1	26						27		20	7						27
	White Fir	193		1	35	8	1	49	99		193		1	35	8	1	49	99		193
32	Sierran Mixed Conifer	2		1	1						2		1	1						2
	White Fir	5			5						5			5						5

33	Jeffrey Pine	3		3	>1						3		3							3
33	White Fir	42		1	25		6	10			42		7	19		6	10			42
34	Sierra Mixed Conifer	3		3							3		3							3
34	White Fir	31			13		>1	15	3		31			13			15	3		31
36	Sierra Mixed Conifer	114		112	2						114		114	1						114
37	Sierra Mixed Conifer	11		11				>1			11		11			>1				11
38	Sierra Mixed Conifer	48		48							48		48							48
40	Jeffrey Pine	0		>1							0		>1							0
40	Sierran Mixed Conifer	9		3	1			4			9	1	3				4			9
Project Area Total		**2069**	**50**	**499**	**772**	**13**	**17**	**367**	**349**	**0**	**2069**	**67**	**1060**	**194**	**13**	**17**	**367**	**349**	**0**	**2069**

Focused on FVS and fire modeling runs, if an uncharacteristically severe wildfire were to occur after Alternative 3 had been implemented, the total weighted CWHR 2.1 habitat suitability would decrease from 0.78 to 0.60 (Table 69). In contrast, wildfire modeled in the No Action Alternative dropped the CWHR 2.1 weighted fisher habitat score to 0.33. If a wildfire were to occur post implementation of Alternative 2, the total weighted CWHR 2.1 habitat suitability score would decrease from 0.76 to 0.61 (Table 69). Therefore, higher quality habitat for fisher would be retained if a wildfire were to occur in the project area post Alternative 2 or 3 treatments rather than if no action was taken . The FVS model further demonstrates that if a wildfire were to occur post treatment under Alternative 3, canopy closure would drop to 39 percent which is significantly higher than in the No Action Alternative (Figure 43).

Change in Availability of Intermediate and Large Trees for Resting and Denning Structures

The maintenance and recruitment of large trees is critical in meeting natal and maternal den requirements needed by fisher. Den trees must be large, and provide sufficient decadence to support a cavity capable of holding a fisher and kits. Research also confirms that fisher reuse of these structures occurs, but not extensively, suggesting the need for a good distribution of these features across the landscape. Providing for large tree recruitment through time is important to insure a supply for their replacement as older trees die and fall. Zielinski et al. (Zielinski, et al., 2004b) argue that retaining and recruiting trees, snags and logs of at least 39 inches dbh, encouraging dense canopies, structural diversity, and retaining and recruiting large hardwoods (especially in the Sierra Nevada) are important for producing high quality fisher habitat. Previously in this document, we discussed the estimated number of rest and den trees required for fishers by home range and calculated a figure of 17 intermediate (11-24” dbh) to large (greater than 24” dbh) trees needed per acre. While this figure involves a number of assumptions, it does quantify what we believe to be a minimum number of required structures.

Based on research studies on fisher conducted on Sierra and Sequoia National Forests, we have selected CWHR size classes 4, 5, and 6 (>11”dbh) to represent potential rest site structures, and trees ≥24” dbh (CWHR size classes 5, and 6) for potential den site structures. These values are thought to account for the vast majority of rest and den structures that could be utilized. It is recognized that the largest size class trees are considered the highest quality for these purposes.

We analyzed plot data collected in 2010 for the Tobias Project Area using the Common Stand Exam protocols that are the national standard for the Forest Service. Data were incorporated into FVS in order to determine the number of live trees and snags per acre (categorized in 2” size classes) under the No Action Alternative, No Action with Wildfire, the proposed Action Alternatives and Action Alternatives with Wildfire. The number of live trees and snags were broken down into two size classes previously discussed to evaluate the potential changes in availability of rest and den structures. Tree species represented in the common stand exam timber inventory data included Jeffrey pine, white fir, and ponderosa pine.

Stand exam data collected in 2010 showed a weighted average of 1.8 snags per acre greater than 15 inches dbh in CWHR 2.1 forested habitat types. The snags were distributed unevenly throughout the vegetation types in the project area. The FVS modeling estimates the weighted average of snags per acre greater than 15 inches dbh at 2.3 for the No Action Alternative in 2014. Although there are no specific objectives to create snags with the Action Alternatives, the FVS model projects that Alternative 2 will have 3.1 snags and Alternative 3 will have 3.4 snags/acre greater than 15 inches dbh following treatments in 2024. Snags would likely be created in the action alternatives during the prescribed fire entries and as a result of harvesting, which is likely to change the forest environment.

Alternative 1:

Direct Effects

Under Alternative 1, no vegetation management activities would occur in the Tobias Project area; therefore, there would be no direct effect to fisher habitat quality, quantity, or distribution. All large trees and snags that are potential rest and den sites would be retained. Under the No Action Alternative the FVS model estimates that in 2024 there would be an average of 73 intermediate (11-24”dbh) and 30 large (greater than 24” dbh) live trees per acre in the Tobias Project area (Table 73).

Indirect Effects

There is a potential for negative indirect effects to fisher and its habitat if the No Action Alternative is selected since no fuels treatments would occur, and the continued threat of uncharacteristically severe wildfire would remain. In failing to make an attempt at density management, the eventual changes congruent under normal drought cycles, continued tree stress, and subsequent insect and disease mortality can be expected to result in further stand declines. These conditions will work to exacerbate the threat and probability for wildfires to burn at higher intensity leading to fires of greater size. Growth of large and intermediate trees would remain stagnant given current stand density and competition for resources, with slowed recruitment of trees into larger size classes. As noted by Sherlock (Sherlock, 2007), (Stine, 2008) and Fettig (Fettig, 2008), drought and insect effects on high densities of small to intermediate size trees, such as is found in the Tobias Project area, can have disproportionate effects on large trees. High density will continue to slow development of larger trees (>24” dbh) over time and the stand will remain at high risk of uncharacteristically severe fire. Furthermore, the high probability of a warmer, drier climate change in the western United States (McKenzie, et al., 2004) would potentially compound these effects.

Uncharacteristically severe wildfires were identified as one of the greatest threats to fisher habitat in the Southern Sierras (Lofroth, et al., 2010). If an uncharacteristically severe wildfire were to occur in the Tobias project area, the existing availability of resting and denning structures are predicted to change dramatically for a longer duration in comparison to action alternatives where treatments would occur (Figures 44 & 45). Modeling of the No Action Alternative with wildfire in 2034 shows a reduction in basal area for trees greater than 24” dbh size class to 100 ft^2/acre, compared to 202 ft^2/acre before the modeled wildfire (Figure 44).

Although significant numbers of new snags may be created by wildfire, the availability of future snags through recruitment of standing live green trees would be significantly decreased (Figures 44 & 45). Further, given that the majority of occupied maternal and natal den trees utilized by fisher occurred in live trees, significant losses of these components and their associated overhead canopy would decrease habitat suitability. Depending on the amount and size of openings created by a fire, fisher may also be required to travel longer distances to reach a suitable rest or den site, resulting in higher individual energetic costs, increased vulnerability to predation, exposure to parasites, and disease.

Alternative 2:

Direct Effects

Alternative 2 includes mechanical thinning of intermediate and large trees on approximately 1,120 acres. The oaks and pines would be retained. Only surface and ladder fuels (shrubs and small trees, less than 10 inches dbh) would be treated in the remaining areas, so the number of intermediate and large trees would be unchanged in those areas.

Under Alternative 2 there would be an average of 67 intermediate (11-24”dbh) and 28 large (> 24” dbh) live trees per acre retained post treatment (Table 73). In comparison to the No Action Alternative, Alternative 2 would result in an average eight percent decrease in the intermediate size class trees and seven percent decrease in the large tree class (Table 73). All trees over 30”dbh would be retained to provide potential rest sites for fisher. Considering the need to provide an estimated 17 trees per acre of suitable resting and denning quality, the post treatment numbers of live trees and snags per acre retained under Alternative 2 appear sufficient based on our current knowledge.

Table 73. Alternative 2: Project analysis area based changes in total number of live trees in moderate and high suitability fisher habitat defined by CWHR 2.1 within the Tobias Project area. Live trees modeled in the Forest Vegetation Simulator (FVS) with thinning occurring in 2024 for Alternative 2.

				Trees 11-24 dbh (trees/acre)			Trees >24 dbh (trees/acre)		
Stand	Total Treated Acres	Total Mod-Hi Acres		No Action	Action Alternative 2	Percent Change	No Action	Action Alternative 2	Percent Change
4	34	13		107	106	-1%	14	14	0%
8	232	71		102	105	3%	16	16	0%
9	4	3		65	65	0%	25	25	0%
12	70	1		83	82	-1%	23	23	0%
13	129	127		56	49	-13%	27	24	-11%
14	40	9		96	99	3%	22	22	0%
16	79	78		75	61	-19%	37	34	-8%

				Trees 11-24 dbh (trees/acre)			Trees >24 dbh (trees/acre)		
Stand	**Total Treated Acres**	**Total Mod-Hi Acres**		**No Action**	**Action Alternative 2**	**Percent Change**	**No Action**	**Action Alternative 2**	**Percent Change**
17	121	0		97	97	0%	20	20	0%
19	35	0		111	110	-1%	13	13	0%
20	114	12		68	67	-1%	31	31	0%
21	89	89		90	78	-13%	22	20	-9%
22	155	152		69	61	-12%	32	29	-9%
23	135	135		52	37	-29%	48	45	-6%
24	87	80		58	49	-16%	38	29	-24%
25	178	168		39	32	-18%	42	35	-17%
27	122	119		58	39	-33%	24	20	-17%
29	169	169		28	26	-7%	56	56	0%
30	342	329		57	51	-11%	36	35	-3%
31	262	248		39	34	-13%	48	45	-6%
32	66	7		91	91	0%	31	31	0%
33	47	45		72	65	-10%	34	29	-15%
34	64	34		58	45	-22%	42	36	-14%
36	114	114		96	78	-19%	20	19	-5%
37	11	11		94	92	-2%	21	21	0%
38	68	48		97	78	-20%	20	19	-5%
40	56	9		52	52	0%	32	32	0%
Total Project Area Acres	**2824**	**2069**	**Total Avg**	**73**	**67**	**-8%**	**30**	**28**	**-7%**

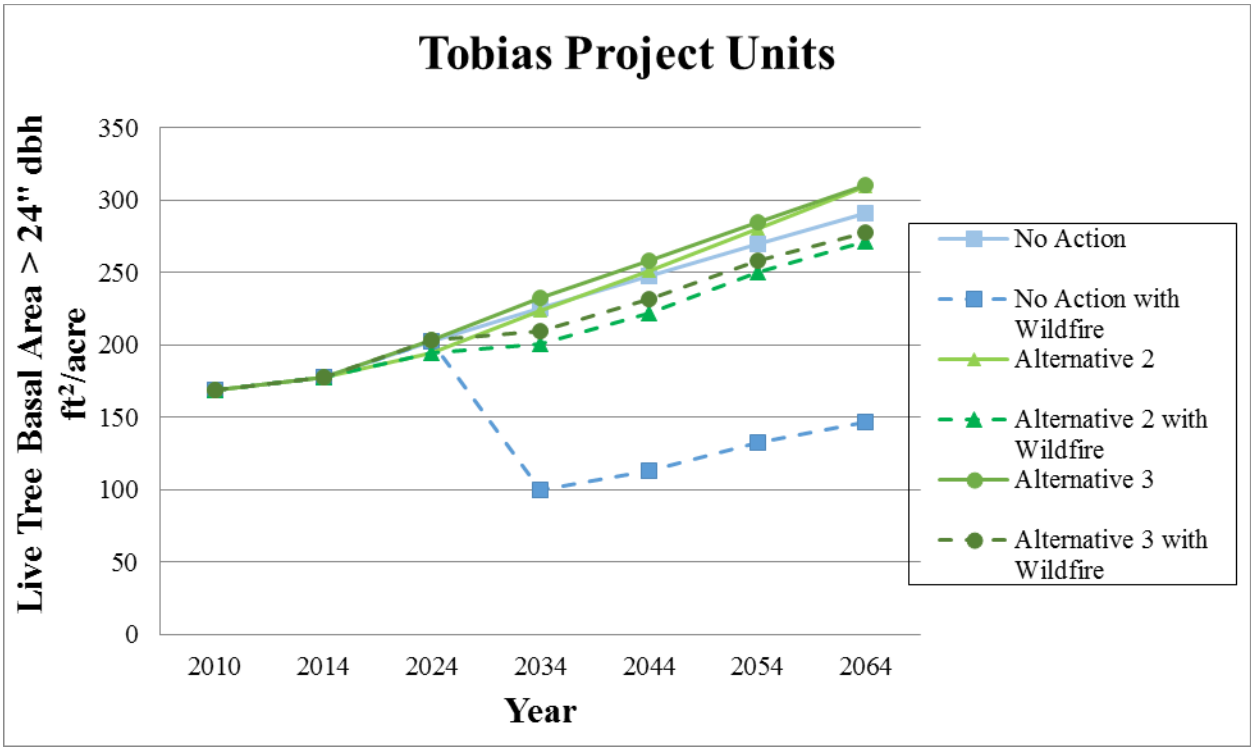


Figure 45. Average live tree basal area >24" dbh projected to year 2064 under the No Action Alternative, No Action with Wildfire, Alternative 2, Alternative 2 with Wildfire, Alternative 3 and Alternative 3 with Wildfire.

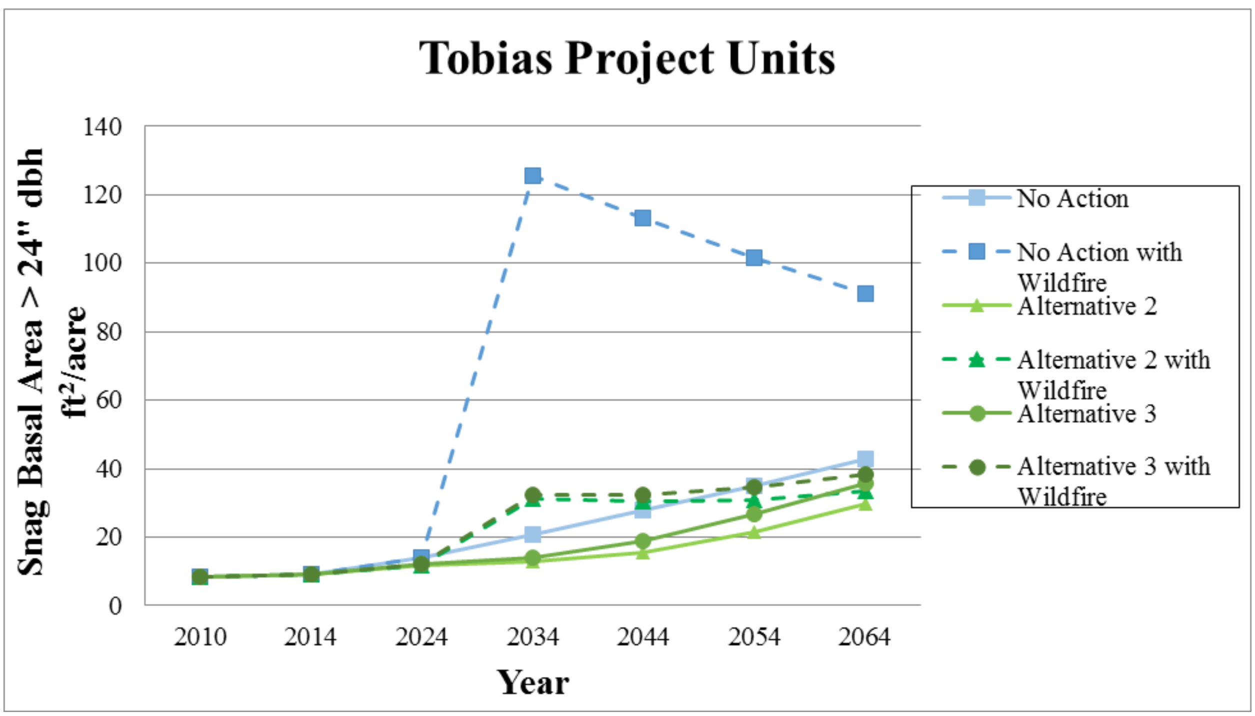


Figure 46. Average snag basal area >24" dbh projected to year 2064 under the No Action Alternative, No Action with Wildfire, Alternative 2, Alternative 2 with Wildfire, Alternative 3 and Alternative 3 with Wildfire.

Under Alternative 2, there would be a decrease in the number of trees greater than 24” dbh in 14 treatment units following implementation of the project (decreases ranging from 3-24 percent) (Table 73). However, by reducing the stand density and competition for limited nutrients and water resources, Alternative 2 may promote the development of larger trees over time compared to the No Action Alternative.

Under Alternative 2, all but six of the treatment units would experience a decrease in the number of trees in the 11-24” dbh size class (ranging from 1-33 percent). However, all units would exceed the desired minimum of 17 trees per acre identified (range 26–110 trees per acre) within the size class (11-24” dbh) used by fisher for rest sites (Table 73).

Indirect Effects

Figures 45 and 46 display the projected availability of large (≥24”dbh) live trees and snags over the next 50 years. The difference between the No Action and Action Alternatives are not dramatic since the thinning is not intensive enough to maximize growth over a short period. Implementation of Alternative 2 would result in a higher basal area of large trees than No Action beginning 20 years post treatment (Figure 45). When the potential for wildfire is considered under both No Action and Alternative 2, the increased availability of large trees in Alternative 2 compared to No Action is clear (Figure 45). A wildfire in the No Action Alternative would lead to the creation of a large number of snags (Figure 46).

Alternative 3:

Direct Effects

There would be no direct effects on the availability of intermediate and large trees in Alternative 3. In this alternative only small non-commercial size trees less than 8” in diameter would be removed. Therefore, current stocking levels of 11-24”dbh size class trees and the 24”dbh and greater size class trees would be retained at near existing levels (Table 74). The decrease of trees seen at the stand level in the two size class categories shown in Table 74 is the result of the prescribed burning treatment as modeled for Alternative 3.

Indirect Effects

Figure 45 displays the projected availability of large (greater than 24”dbh) live trees over the next 40 years. The difference between Alternative 3 and the No Action Alternative is not dramatic since the treatment is not significant enough to maximize growth over a short period. Alternative 3 mirrors expected outcomes as presented under the No Action Alternative and is projected to have more large trees than Alternative 2. Similar outcomes are shown when the potential for wildfire is considered, with Alternative 3 higher than Alternative 2 and the No Action Alternative (Figure 45).

Table 74. Alternative 3: Project analysis area based changes in total number of live trees in moderate and high suitability fisher habitat defined by CWHR 2.1 within the Tobias project area. Live trees modeled in the Forest Vegetation Simulator (FVS) with thinning occurring in 2024 for Action Alternative 3.

				Trees 11-24 dbh (trees/acre)			Trees >24 dbh (trees/acre)		
Unit	Total Acres	Total Mod-Hi Acres		No Action	Action Alternative 3	Percent Change	No Action	Action Alternative 3	Percent Change
4	34	13		107	108	1%	14.49	13.84	0%
8	232	71		102	105	3%	16	16	0%
9	4	3		65	65	0%	25	25	0%
12	70	1		83	82	-1%	23	23	0%
13	129	127		56	50	-11%	27	25	-7%
14	40	9		96	99	3%	22	22	0%
16	79	78		75	75	0%	37	38	3%
17	121	0		97	97	0%	20	20	0%
19	35	0		111	110	-1%	13	13	0%
20	114	12		68	67	-1%	31	31	0%
21	89	89		90	88	-2%	22	22	0%
22	155	152		69	68	-1%	32	32	0%
23	135	135		52	52	0%	48	49	2%
24	87	80		58	59	2%	38	38	0%
25	178	168		39	36	-8%	42	39	-7%
27	122	119		58	39	-33%	24	20	-17%
29	169	169		28	29	4%	56	59	5%
30	342	329		57	52	-9%	36	35	-3%
31	262	248		39	39	0%	48	49	2%
32	66	7		91	91	0%	31	31	0%
33	47	45		72	72	0%	34	34	0%
34	64	34		58	58	0%	42	42	0%
36	114	114		96	94	-2%	20	20	0%
37	11	11		94	92	-2%	21	21	0%
38	68	48		97	95	-2%	20	20	0%
40	56	9		52	52	0%	32	32	0%
Total Project Area Acres	**2824**	**2069**	**Total Avg**	**73**	**72**	**-1%**	**30**	**30**	**0%**

*All acres are derived in GIS and are approximate, therefore they are rounded to the nearest whole number. Total acres may vary due to rounding.

HABITAT CONNECTIVITY

Alternative 1:

DIRECT EFFECTS

Under Alternative 1, there would be no direct effect to fisher habitat quality, quantity, or distribution. There will be no direct change to habitat connectivity under the No Action Alternative.

Indirect Effects

There may be indirect effects to fisher habitat connectivity if the No Action Alternative is selected as the continued immediate threat of uncharacteristically severe wildfire remains unabated. As previously mentioned, the McNally Fire of 2002 burned nearly 150,000 acres along the northeastern boundary of the Tobias Project area. This uncharacteristically severe wildfire left large tracts of high severity burn areas, thereby creating patches of habitat unsuitable to fisher for resting and denning. Long term consequences of uncharacteristically severe wildfire have the potential to eliminate large contiguous acreages of habitat, further fragmenting this isolated Southern Sierra fisher population which could potentially lead to extirpation.

Alternative 2: PROPOSED ACTION

Direct Effects

Tree size classes in the Tobias Project area would be unchanged by treatments and would be the same as in the No Action Alternative. However, 561 acres are projected to change from D (>60%) to M (40-59%) and 17 acres from M to P (25-39%) density classes following treatments (Table 75). Therefore, 96 percent of the habitat in the treatment areas would still provide continuous forest cover, dominated by moderate to large trees.

When examining the effects on a 7th order watershed scale (approximately 4,187 acres) overlapping the Tobias Project area, a 14 percent decrease in density class D (>60%) and a 14 percent increase in density class M (40-59%) will occur if Alternative 2 is implemented, compared to No Action (Table 75). The end result is still within the range of habitat conditions considered as high and moderate habitat quality for fisher in the CWHR 2.1 system. There is no evidence that habitat of the type remaining after thinning in the Tobias Project will be a barrier to movement of fisher. Considering the fragmented landscape created by the McNally Fire adjacent to the Tobias Project area, it is essential that the implementation of Alternative 2 protect remaining suitable habitat from uncharacteristically severe fire and not contribute to further fragmentation. Weir's (Weir, 2003) summary of fisher dispersal gives no indication that modest changes in habitat structure of the relatively small size and low contrast to existing forest would create barriers to movement or foraging use.

INDIRECT EFFECTS

The untreated areas and interconnected riparian zones will accommodate daily fisher movements as well as dispersal movements, providing habitat connectivity throughout the Tobias Project area and beyond. Within the Tobias Project area, fisher should also retain movement opportunities between adjacent moderate to high quality habitat areas similar to those found with consistent detections during the status and trend monitoring for fisher across Sequoia National Forest (USDA-FS, 2014)). These areas of dense and moderate canopy closure values provide a visual representation of movement capabilities throughout the project area and across the affected 7^{th} order watersheds during project implementation and post-treatment.

Table 75. Alternative 2: Changes in percent of canopy closure density class categories in moderate and high suitability fisher habitat defined by CWHR 2.1 within the 7th Order Watersheds affected by the Tobias Project area. Modeled in the Forest Vegetation Simulator (FVS) with thinning occurring in 2024 for Action Alternative 2.

	No Action					Alternative 2				
Affected 7th Order Watersheds	Dense Canopy Closure 60-100%	Moderate Canopy Closure 40-59%	Open Canopy Closure 25-39%	Sparse Canopy Closure 0-24%	Total Acres	Dense Canopy Closure 60-100%	Moderate Canopy Closure 40-59%	Open Canopy Closure 25-39%	Sparse Canopy Closure 0-24%	Total Acres
9CJ	73	204	33	0	**310**	73	204	33	0	**310**
9CK	118	210	10	0	**339**	118	210	10	0	**339**
9CM	26	36	6	0	**67**	26	36	6	0	**67**
9CO	44	55	0	0	**100**	44	55	0	0	**100**
9DA	92	203	12	36	**344**	27	268	14	36	**344**
9DB	326	117	5	8	**456**	239	201	9	8	**456**
9DC	310	136	11	5	**463**	157	284	17	5	**463**
9DD	470	567	40	0	**1077**	262	771	44	0	**1077**
9DE	288	383	8	0	**679**	226	446	8	0	**679**
9DJ	23	153	0	1	**177**	23	153	0	1	**177**
9DL	9	12	0	0	**21**	8	12	1	0	**21**
9DM	66	30	0	0	**96**	66	30	0	0	**96**
9DN	22	36	0	0	**58**	22	36	0	0	**58**
Total Acres	**1869**	**2143**	**124**	**51**	**4187**	**1291**	**2704**	**141**	**51**	**4187**
Total Percent of Area	**45%**	**51%**	**3%**	**1%**	**100%**	**31%**	**65%**	**3%**	**1%**	**100%**

Alternative 3:

Direct Effects

Since treatments in this alternative would be limited to thinning of small trees 8”dbh or less and prescribed fire, no changes in CWHR tree size classes are predicted to occur and smaller changes in density classification are expected. Only 430 acres are projected to change from D (>60%) to M (40-59%) and 13 acres from M to P (25-39%) density classes following treatments (Table 76). Therefore, the area will still provide continuous forest cover, dominated by moderate to large trees available across the landscape.

When examining the effects on a 7th order watershed scale overlapping the Tobias Project area, a 14 percent decrease in density class D (>60%) and a 14 percent increase in density class M (40-59%) will occur if Alternative 3 is implemented, compared to No Action (Table 76). The end result is still within the range of habitat conditions considered as high and moderate habitat quality for fisher in the CWHR 2.1 system.

INDIRECT EFFECTS

The untreated areas and interconnected riparian zones will accommodate daily fisher movements as well as dispersal movements, providing habitat connectivity throughout the Tobias Project area and beyond as previously discussed under Alternative 2. These areas of dense and moderate canopy closure values provide a visual representation of movement capabilities throughout the project area and across the affected 7th order watersheds during project implementation and post-treatment.

Table 76. Alternative 3: Changes in percent of canopy closure density class categories in moderate and high suitability fisher habitat defined by CWHR 2.1 within the 7th Order Watersheds affected by the Tobias Project area. Modeled in the Forest Vegetation Simulator (FVS) with thinning occurring in 2024 for Action Alternative 3.

	No Action					Alternative 3				
Affected 7th Order Watersheds	Dense Canopy Closure 60-100%	Moderate Canopy Closure 40-59%	Open Canopy Closure 25-39%	Sparse Canopy Closure 0-24%	Total Acres	Dense Canopy Closure 60-100%	Moderate Canopy Closure 40-59%	Open Canopy Closure 25-39%	Sparse Canopy Closure 0-24%	Total Acres
9CJ	73	204	33	0	**310**	73	204	33	0	**310**
9CK	118	210	10	0	**339**	118	210	10	0	**339**
9CM	26	36	6	0	**67**	26	36	6	0	**67**
9CO	44	55	0	0	**100**	44	55	0	0	**100**
9DA	92	203	12	36	**344**	43	252	14	36	**344**
9DB	326	117	5	8	**456**	282	159	7	8	**456**
9DC	310	136	11	5	**463**	159	283	15	5	**463**
9DD	470	567	40	0	**1077**	303	732	43	0	**1077**
9DE	288	383	8	0	**679**	273	399	8	0	**679**
9DJ	23	153	0	1	**177**	23	153	0	1	**177**
9DL	9	12	0	0	**21**	8	12	1	0	**21**
9DM	66	30	0	0	**96**	66	30	0	0	**96**
9DN	22	36	0	0	**58**	22	36	0	0	**58**
Total Acres	**1869**	**2143**	**124**	**51**	**4187**	**1439**	**2561**	**137**	**51**	**4187**
Total Percent of Area	**45%**	**51%**	**3%**	**1%**	**100%**	**34%**	**61%**	**3%**	**1%**	**100%**

EFFECTS OF WILDFIRE ON FISHER HABITAT

The Trade-Offs Between Fuels Reduction Activities and Wildfire

As previously discussed, the Conservation Biology Institute (CBI) conducted a computer simulation study of the interactions between fuels management, forest fires, fisher habitat, and the fisher population in the southern Sierra Nevada (Spencer, et al., 2008) (Syphard et al. 2011) (Scheller et al. 2011). Results of the simulations demonstrated that treatments may effectively reduce the extent and severity of fire on the landscape over a 50-year time span.

Across the broad spatial scales CBI examined, given specific assumptions disclosed in (Spencer, et al., 2008) about how thinning treatments affect fuel characteristics, fire spread rates, and fire severity, and within the finite combinations of fire regimes and treatments tested, it was concluded that the long-term positive effects of fuel treatments (due to the reduction of fire hazard) outweighed the short-term negative effects of fuel treatments (due to immediate loss of forest biomass) on fisher. This was especially true assuming a more severe fire regime in the future. Spencer et al. (Spencer, et al., 2008) places the tradeoffs of short-term habitat degradation for long term benefit in clear context for the southern Sierra Nevada fisher population and habitat as a whole, demonstrating specific conditions where short-term detriment for long-term habitat maintenance is acceptable.

WILDFIRE MODELING

Wildfire modeling for the Tobias project area was completed using the Fire and Fuel extension within the FVS modeling software. The No Action Alternative was modeled which examined uncharacteristically severe wildfire under the current fuels conditions in 2034. Other model input conditions included fuel moisture, wind speed, temperature, season, and terrain.

As of 1998 (Truex, et al., 1998), known natal dens in the Southern Sierra were located in white fir or black oak. Subsequent studies have found that most natal and maternal dens in the Southern Sierra were located in large live conifers (white fir, sugar pine or ponderosa pine) or oaks (California black oak) (Truex, et al., 1998) (Mazzoni, 2002) (Zielinski, et al., 2004b). Large diameter black oaks and canyon live oaks compose almost half of the rest sites used by fishers in the Tule River Canyon, Western Divide Ranger District, Sequoia National Forest (Zielinski, et al., 2004b). There is no specific information about tree species used for denning and resting by fishers in the Tobias project area.

The Tobias project area contains large black oaks (>18”dbh) as well as large white fir and sugar pines (>24”dbh). We chose to analyze the large trees of these species in the project area since they are likely important for fisher resting and denning. The model calculated numbers of these large trees across the units (Table 77).

Alternative 1:

Direct Effects

Under the No Action Alternative, no vegetation treatments would occur in the Tobias project area, therefore there would be no direct effects to fisher habitat quality, quantity, or distribution. The habitat available to fisher for foraging, reproduction, and movements will not change.

Indirect Effects

Uncharacteristically severe wildfires were identified as one of the greatest threats to fisher habitat in the Southern Sierras (Lofroth, et al., 2010). Under the No Action Alternative vegetation treatments would be foregone. This option, while immediately preserving all habitats, discounts one of the major ecosystem processes indicative of the Sierra Nevada. It is therefore unrealistic and dangerous to assume that we can prevent fires from occurring. Due to the disruption of normal fire cycles, several indirect effects from the lack of direct treatment can be expected and are foreseeable using FVS modeling. Without treatment, forested stands would continue in their trend for higher fuel loading and greater dominance of small trees. Critical habitat features such as overhead canopy and the availability of large live trees (specifically preferred species such as black oak, sugar pine and white fir) would be lost and take substantially longer to replace (in excess of 50 years), than the implementation of either action alternative.

Large black oak, white fir and sugar pine trees have been shown to be important tree species used by fisher for natal dens, maternal dens and resting structures in Sequoia National Forest. The FVS model estimated average mortality rates of 93 percent for large black oaks, 39 percent for white fir trees and 11 percent for sugar pines if uncharacteristically severe wildfire were to occur under the No Action Alternative (Table 77). If a severe wildfire burned through the Tobias Project area, the availability of these trees for fisher den and rest sites would be greatly reduced.

Table 77. No Action Alternative: Project analysis area based changes in total number of live black oak, white fir and sugar pine trees in moderate and high suitability fisher habitat defined by CWHR 2.1 within the Tobias project area. Modeled using the Forest Vegetation Simulator (FVS) for a wildfire occurring in 2034.

		Black Oak Trees >18" dbh (trees/acre)			White Fir Trees >24" dbh (trees/acre)			Sugar Pine Trees >24" dbh (trees/acre)		
Unit	Total Mod-Hi Acres*	No Action	No Action with Wildfire	Percent Change	No Action	No Action with Wildfire	Percent Change	No Action	No Action with Wildfire	Percent Change
4	13	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
8	68	0.4	0.0	-90%	2.9	2.0	-33%	1.0	1.0	-1.5%
9	4	0.0	0.0	-	0.0	0.0	-13%	0.0	0.0	-7.9%
12	1	4.1	0.4	-90%	8.2	8.2	0%	8.4	8.4	0.0%
13	127	0.5	0.1	-90%	10.9	9.8	-11%	4.8	4.3	-9.9%
14	9	0.4	0.0	-92%	15.5	10.4	-33%	0.6	0.6	-0.9%
16	78	0.5	0.0	-98%	34.1	8.9	-74%	0.2	0.2	-7.9%
17	0	6.0	0.6	-90%	10.9	10.2	-6%	13.0	12.9	-0.9%
19	0	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
20	12	3.4	0.3	-90%	24.8	23.8	-4%	7.7	7.6	-1.2%
21	89	3.2	0.3	-90%	8.2	6.6	-20%	7.8	7.5	-4.5%
22	152	2.2	0.2	-90%	26.2	22.4	-14%	5.0	4.9	-2.3%
23	135	0.5	0.0	-95%	41.3	1.7	-96%	0.8	0.8	-3.5%
24	84	0.1	0.0	-99%	15.3	11.4	-26%	1.1	0.4	-66.6%
25	176	0.1	0.0	-96%	17.8	4.3	-76%	5.6	2.4	-56.5%
27	122	1.4	0.1	-90%	8.5	7.5	-11%	6.2	5.9	-4.4%
29	169	0.0	0.0	-100%	50.4	6.2	-88%	0.0	0.0	-47.8%
30	325	0.5	0.0	-91%	8.6	3.5	-60%	1.2	1.1	-9.8%
31	252	0.1	0.0	-100%	30.5	0.8	-97%	0.5	0.4	-9.3%
32	7	1.1	0.1	-94%	25.0	2.6	-90%	1.7	1.6	-1.8%
33	45	0.3	0.0	-100%	22.2	5.2	-77%	0.0	0.0	-
34	34	0.8	0.1	-93%	39.8	21.7	-45%	1.2	1.2	-0.9%
36	114	5.9	0.6	-90%	10.9	10.1	-7%	12.8	12.7	-1.0%
37	11	5.8	0.6	-90%	10.6	9.8	-7%	12.6	12.4	-1.4%
38	68	4.2	0.4	-90%	7.6	7.1	-6%	9.1	9.0	-0.9%
40	14	1.3	0.1	-90%	6.1	4.4	-28%	6.5	4.0	-38.9%
Total Project Area Acres	2108	1.6	0.2	-93%	16.8	7.6	-39%	4.0	3.8	-11%

Alternative 2:

DIRECT EFFECTS

Overall, the implementation of Alternative 2 would reduce the quality of fisher habitat in the short-term by reducing canopy closure and removing some of the intermediate and large trees in the project area. The area would still provide continuous forest cover, dominated by the largest trees available, as all trees over 30"dbh would be retained. While Alternative 2 would result in a reduced risk of uncharacteristically severe wildfire, enough large trees would be retained to provide the estimated minimum 17 trees per acre of suitable resting and denning quality. Conservation of these large diameter trees is important to ensure adequate resting/denning sites for fisher as these structures are thought to be most limiting across the environment.

INDIRECT EFFECTS

As seen with the Stormy and McNally Fires, uncharacteristically severe fires can affect large areas of landscape, and can drastically decrease or remove key structural and habitat elements for fisher including large trees, snags, overstory and understory canopy, vegetative diversity, and down logs. Fishers exhibit strong selection for rest and den sites based upon forest structure and canopy cover. Changes in the frequency, abundance, and distribution of these habitat elements may create conditions unfavorable to successful reproduction, as well as survival of the young to recruitment into the population. Lack of well-distributed escape cover may result in increased predation.

Fisher habitat linkages would likely be disrupted by uncharacteristically severe wildfire burning through the Tobias project area and creating a landscape of large monotypic eco-type fragments, such as large shrublands or early stage forests. In contrast, mature and late-seral forests burned with lower intensity fires typically have a mosaic of micro habitats and horizontal and vertical structural diversity necessary for fisher habitat use.

The disruptions from uncharacteristically severe fires could be temporary until habitat recovers over a half century or more, or they could be permanent if severe fire led to vegetation type conversions. Fragmented landscapes resulting from these severe fires could have severe detrimental effects to fisher daily movements and energy balance. If an uncharacteristically severe wildfire burned through the Tobias project Area, currently suitable habitat may become unsuitable for several decades. Displaced individuals could create conspecific competition for resources if packed into the remaining habitat, which could also increase disease transmission. This habitat fragmentation could also limit fisher dispersal movements, affect the establishment of home ranges, and prolong or prevent breeding season movements, leading to a decrease in fisher survival. Overall population fitness is affected by individual survival and mortality. In small, isolated populations such as the Southern Sierra fisher, severe and prolonged fragmentation can lead to extirpation.

Alternative 3:

DIRECT EFFECTS

Alternative 3 proposes modest changes in stand structure and will not represent a sharp contrast to the existing condition regarding elements important to the fisher. The area will still provide continuous forest cover, through the retention of existing medium and large trees. Retaining all large diameter trees will insure that resting/denning substrates are maintained across treated units. Large tree structures with decadence features such as cavities, broken tops, etc. are thought to be the most limiting factor across contemporary forest landscapes, and which often take the longest to replace when lost.

Under this alternative all trees removed would be less than 8 inches dbh. Little change in basal area values contributed by the largest size class trees per unit would occur. Therefore, an adequate representation of trees in the largest size ranges most commonly used by fishers for rest and den purposes would be maintained. Existing aggregates and dense patches of medium and large trees would also continue to occur along with a diversity of snags, and concentrations of large woody debris. These conditions retained throughout the units along with untreated areas in between units will provide a continuum of suitable habitat and den/rest features.

INDIRECT EFFECTS

As previously mentioned, uncharacteristically severe fires on the Sequoia National Forest have dramatically impacted the availability of forested habitat over the last two decades. As discussed under Alternative 2, impacts of this nature have resulted in substantial losses in the availability and distribution of key attributes commonly selected by fisher for rest and den purposes (stands with larger trees and denser canopy) and increased fragmentation between areas of suitable habitat. Further losses in habitat in the Greenhorn Mountains may have negative and long lasting influences on fisher habitat linkages should a wildfire occur. Habitat at the southern extent of the fisher's range is comprised by a relatively narrow belt of habitat. The treatments proposed in Alternative 3 would reduce the risk of habitat loss to severe wildfires with less of a loss in fisher habitat quality in the short-term.

CUMULATIVE EFFECTS

Cumulative Effects Boundary and Timeline

The cumulative effects analysis was conducted at three spatial scales: 1) Core Area 2 as defined by the Southern Sierra Nevada Fisher Conservation Assessment and Strategy, 2) the southern Sierra sub-population, and 3) the entire Southern Sierra Fisher Conservation Area (Sierra Nevada Forest Plan Amendment FEIS ROD January 2001).

The cumulative effects temporal boundary is 20 years into the future. This is an appropriate scale for determining the cumulative effects to fishers from the Tobias Project since it includes the time period that habitat is likely to be affected by the project. Life expectancy of fishers is believed to be approximately 10 years of age (Powell, 1993), therefore this cumulative effects temporal boundary would affect two generations of fisher.

Core Area 2

Fisher habitat in the southern Sierra Nevada is segmented into a series of core habitat areas separated primarily by major river canyons, across which fishers may occasionally disperse via linkage areas. The cores were delineated using a landscape-level habitat model to reflect current fisher occupancy patterns, genetic subdivisions in the population (Tucker et al. 2014), and significant breaks in fisher habitat. They exclude small, isolated patches of habitat that are unlikely to support more than a few individual fishers. Linkage areas were delineated using models that represent the least costly or risky potential dispersal areas between cores, based on mapped habitat features.

Cores comprise "live-in" habitat, where fishers can establish home ranges and meet their various life requisites, including food, shelter, and mates. Within each occupied core, fishers are expected to co-mingle, interbreed, disperse, and establish home ranges relatively freely, but dispersal between cores appears to be rare, especially for females (Tucker 2013). Although fisher dispersal is not well studied in the field, evidence suggests that fishers will not move through large areas lacking overhead cover, and genetic analyses suggest that female fishers primarily disperse through dense forest stands with large trees (Tucker 2013). Fisher experts expect that shrubs (e.g., chaparral) may provide sufficient hiding and escape cover for dispersing fishers, especially males, in non-forested portions of linkage areas.

Core 2 includes the southwestern tip of the Sierra Nevada and Greenhorn Mountains—between the Kern River and Bear Creek in the Tule River watershed—mostly on Sequoia National Forest and Giant Sequoia National Monument. Genetic patterns suggest this area may have served as a refuge for fishers following European settlement—perhaps due to steep terrain that limited human impacts compared to other areas (Beesley 1996)—and the population may have re-expanded northward from this area during the 20th century.

Zielinski et al. (2004) found fishers to have smaller home ranges in Core 2 than in other regions, which they suggested may be due to high quality habitat (dense mixed-coniferous forests, large trees, and abundant black oak). Statistical analysis of female home range composition shows that home ranges in the high-quality habitat in the western portion of Core 2 have higher average tree basal area, greater black oak basal area, greater diversity of tree diameter classes, more dense (>70%) canopy cover, and a greater coverage of high-value fisher CWHR (California Wildlife Habitat Relationships) reproductive habitat than home ranges in Cores 4 and 5. These results probably reflect the greater availability of old-forest habitat conditions from which fishers can select home range areas, compared with other cores. Core Area 2 encompasses an estimated 231,392 acres with 137,388 acres of suitable CWHR 2.1 habitat.

SOUTHERN SIERRA SUBPOPULATION AREA

Tucker et al. (2014) found a basis for identification of fisher sub populations in the Southern Sierras based on genetic information. As previously discussed, these included a sub population north of the Kings River in Sierra NF and Yosemite National Park, a 2nd sub population encompassing Sequoia and Kings Canyon National Parks and the Hume Lake Ranger District of Sequoia NF, and a 3rd comprising the area south of Mountain Home State Forest, including the Kern Plateau and southern portion of Sequoia National Forest. The narrow band of suitable habitat at the southwestern extent of Sequoia National Park apparently limits genetic exchange between fisher in the southern portion of the Sequoia National Forest and fisher sub populations further north. The genetic isolation is not to the point found by Wisely (Wisely, et al., 2004) but preliminary analysis does provide a logical break to identify a sub population of fisher in the southern section of Sequoia National Forest and for cumulative effects analysis (J. Tucker, pers. comm.). The southern sub population encompasses an estimated 716,901 acres with 242,524 acres of suitable CWHR 2.1 habitat.

Consideration of Past Actions

This analysis relies on current environmental conditions as a surrogate for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. Existing acres of CWHR vegetation type were determined using a GIS layer published by the USDA Forest Service, Pacific Southwest Region Remote Sensing Lab and updated with stand exam data in 2010.

For the purposes of this analysis the most recent Forest vegetation GIS layer was used to establish baseline conditions for the project and analysis area. This vegetation layer is created from remote-sensing imagery obtained at various points in time, which are verified using photo-imagery, on-the-ground measurements, and tracking of vegetation-changing actions or events. Updates included in the layer include fire and vegetation treatment changes to CWHR habitat.

For assessment of future projects, the Forest completes a quarterly Schedule of Proposed Actions (SOPA) which tracks proposals that are ongoing or have sufficient detail to insure they are reasonably foreseeable (generally not more than 5 years out). The total list of actions presented on the SOPA is not included here. Some projects have been cancelled or are undergoing revision, with others not included because they have limited scope and intensity and present no appreciative impact on available fisher habitat.

Forest Service Actions - Timber Harvest/Silviculture/Fuel Treatments

The Fisher Biological Evaluation displays potential habitat altering projects that have occurred or that are ongoing at the sub population scale for both Forest Service and private lands. Private or state harvest in non-suitable habitat and/or salvage harvest are not displayed since they do not affect habitat variables that would result in changes to the CWHR 2.1 habitat for fisher. This analysis includes adjacent projects that are currently under contract, but that have been enjoined from further action until new NEPA documentation is prepared. Technically, these projects are not “reasonably foreseeable” since new NEPA documentation has not been scheduled or reviewed by the court. However since still under contract, they remain part of this analysis.

Core Area 2

The southern Sierra Nevada Fisher Conservation Strategy proposed the following guideline:

- Design treatments to keep affected management grid cells in suitable fisher habitat condition *and* limit disturbance from mechanical treatments to <13% of the affected cells over a five year period (Zielinski et al. 2013b) or <25% over a 10-year period, unless treatments will not fragment fisher core or linkage areas and will better meet fisher conservation objectives. In areas at highest risk of severe fire in critical locations, up to 30% of the area may be treated over a 5-year period or up to 50% in a 10-year period, so long as the retention guidelines are adhered to and fisher core or linkage areas are not fragmented.

Over the last five years, approximately 21,967 acres of commercial or precommerical thinning have been treated, or were proposed for treatment, within Core Area 2. Of the 21,967 acres, approximately 8,863 acres are suitable for fisher occupancy which equates to approximately 6.4% of the CWHR 2.1 suitable habitat available within the Core Area 2 cumulative effects analysis area. All actions were crafted either under CASPO Interim Guidelines or under provisions of the Sierra Nevada Forest Plan Amendment (USDA-FS, 2001) (USDA-FS, 2004a), which individually modified forest plans in Region 5 at various times (USDA-FS, 1993) (USDA-FS, 2001) (USDA-FS, 2004a). These documents took an ecologically-based approach and developed a series of recommendations and implemented specific standards and guidelines that would be beneficial in conserving habitat for species such as the fisher. Examples include provisions for maintenance of canopy closure, snag retention levels, coarse woody debris retention levels, and protection of known roost/nest (spotted owl/goshawk) and fisher den locations. Therefore with the addition of the Tobias Project proposed treatments, Core Area 2 will experience far less disturbance than the <13% guideline proposed by the Fisher Conservation Strategy.

Southern Sierra Subpopulation Area

Since 2010 approximately 41,146 acres have been treated, or were proposed for treatment, within the fisher genetic sub population on Sequoia National Forest lands. Of the 41,146 acres, approximately 15,952 acres are suitable for fisher occupancy which equates to approximately 6.6% of the CWHR 2.1 suitable habitat available within the sub population cumulative effects analysis area. All actions were crafted either under CASPO Interim Guidelines or under provisions of the Sierra Nevada Forest Plan Amendment (USDA-FS, 2001) (USDA-FS, 2004a), which individually modified forest plans in Region 5 at various times (USDA-FS, 1993) (USDA-FS, 2001) (USDA-FS, 2004a). These documents took an ecologically-based approach and developed a series of recommendations and implemented specific standards and guidelines that would be beneficial in conserving habitat for species such as the fisher. Examples include provisions for maintenance of canopy closure, snag retention levels, coarse woody debris retention levels, and protection of known roost/nest (spotted owl/goshawk) and fisher den locations. Measures also focus out-year treatments within wildland urban intermix where dense fuel conditions and human activity provide the highest susceptibility for wildfire to develop and spread. Therefore, these measures are anticipated to decrease the opportunity for future losses of fisher habitat from wildfire.

Of the estimated 15,952 acres, approximately 12,662 were for commercial thinning projects with accompanying fuels treatment (pile burn, underburn). Approximately 3,260 included fuels reduction projects that focused primarily on thinning of small diameter trees (<11”dbh) and brush, with accompanying prescribed fire (pile burn, underburn, Jackpot burn). Commercial harvest operations may result in the incremental loss of overhead canopy and some den or rest structures. However, all actions contained stated provisions for the retention of trees 30”dbh or greater. This size class range appears to be the most commonly selected group for reproductive purposes and these attributes would remain across the landscape. Accompanying fuels reduction treatments which focus on small tree thinning or under burning do not dramatically change canopy cover or CWHR size or density classifications associated with high or moderate quality fisher habitat.

Understory thinning and brush removal projects such as Camp Nelson, Ponderosa, and Tule River Reservation Protection (TRRP) affect a relatively small proportion of the landscape and primarily thin only small trees (<12" dbh) that are quickly replaced and do not represent a significant change in fisher habitat suitability.

Hazard reduction projects remove dead trees that place the public at risk, and may remove trees of medium and large size classes. However, these actions reflect treatments which occur within small linear strips of habitat near roads or trails and where human access and ambient noise disturbance occurs. As such they generally are not used for rest or reproductive purposes. In addition, removals of hazard trees occur in a sporadic fashion in response to drought conditions, insect attack or other factors. Therefore, their removal often does not occur uniformly throughout the habitat leaving many areas untreated.

Actions on Non-Forest Service Land

Reviews of actions on non-Forest Service land were evaluated through available timber harvest plans. There are an estimated 11,289 acres of habitat within Core Area 2 and the southern Sierra sub population area estimated for non-Forest Service land. Treated acres were estimated to include 1,707 acres or 15% of non-Forest Service land in the sub population area.

Fire History

Several wildfires have occurred within the Sierra sub-population cumulative effects analysis area since 2010. These fires collectively burned an estimated 30,000 acres, including some CWHR 2.1 habitats. Some canopy cover reductions occurred in moderate and high burn severity areas, but habitat conditions remained relatively stable in unburned or low severity burn areas.

Southern Sierra Fisher Conservation Area

The Southern Sierra Fisher Conservation Area (SSFCA) is a Forest Service mapped land allocation designated by the Sierra Nevada Forest Plan Amendment (USDA-FS, 2001) and continued in the 2004 Sierra Nevada Forest Plan Amendment. The nearly 1.5 million acre area encompasses the known occupied range of fishers on National Forest System land in the Sierra Nevada. The area consists of an elevation band from 3,500 feet to 8,000 feet on the Sierra and Sequoia National Forests.

The Conservation Biology Institute conducted a computer simulation study of the interactions between fuels management, forest fires, fisher habitat, and the fisher population in the southern Sierra Nevada (Spencer, et al., 2008). Their study area included the SSFCA. The 2002 forest vegetation GIS layer, based on interpretation of 2001 aerial photo imagery with an update in 2003 to reflect changes from the McNally Fire, was used by Spencer et al. (Spencer, et al., 2008). Three fuel treatment rates (2, 4, and 8%) were tested, which were defined as the proportion of treatable landscape treated over a five-year time interval. Treating only 2% of the treatable landscape every five years (or up to 10% of the treatable landscape over 20 years) had no significant effect on fire or fishers at the landscape level, while treating 4% to 8% of the treatable landscape every five years (or up to 20-32% of the treatable landscape over 20 years) was effective in reducing fire and benefiting fishers. Results of the simulations demonstrated that treatments may effectively reduce the extent and severity of fire on the landscape over a 50-year time span. Given the right combinations of treatment rate, intensity, and location, the benefits to fishers of reducing fire outweigh the cumulative negative effects of the treatments themselves on fishers.

Further computer simulations were conducted by the Conservation Biology Institute to refine population models and assess habitat conservation opportunities, including forest vegetation management actions to reduce fire risk in the southern Sierra Nevada (Spencer, et al., 2010). Their study indicated that total above-ground biomass of trees was the strongest predictor of fisher habitat value in the models, rather than more specific forest structure variables such as tree species, size and density. However, total forest biomass correlates closely with results from numerous field studies that predict habitat selection at fine scales (large trees, dense canopy and coarse woody debris). Spencer et al. (Spencer, et al., 2010) determined that in general vegetation management, fires, and other disturbances that decrease forest biomass or fragment areas with high biomass will have adverse effects on fisher. Therefore, as concluded previously in Spencer et al. (Spencer, et al., 2008), fuel treatment strategies designed to reduce the risks of severe fire will need to incorporate treatment intensity, location, and retention of important habitat elements to minimize effects to fisher in the face of increasingly severe fire conditions.

Based on the SOPA's for the Sierra and Sequoia National Forests (Accessed 7/22/2015) and considering all the reasonably foreseeable projects in the SSFCA, it is likely that far less than 20% of the treatable landscape in the SSFCA will be impacted by vegetation management activities. While present and reasonably foreseeable vegetation treatments occurring or proposed on the Sierra and Sequoia National Forests will result in temporary reductions to some limited acres of fisher habitat suitability, these effects overall are short term, and will reduce the risk of uncharacteristically severe wildfire. Uncharacteristically severe wildfire, such as the recent Rim and Rough fires can cause significant long-term habitat degradation and fragmentation. Projects are predicted to ultimately result in an increase of the quality and amount of fisher habitat within project boundaries over the long term. Therefore, the effects to fisher by reducing fire through vegetation management will likely be neutral or beneficial compared to the minimal negative cumulative effects at the scale of the SSFCA.

Cumulative Effects Conclusion

The pattern of small, relatively light thinning and fuels reduction projects proposed or approved on National Forest System lands cumulatively affect less than 8% of the available suitable fisher habitat at each of the scales considered. There is relatively little private land within the landscapes analyzed and non-Forest Service timber harvest is mostly on State Lands at Mountain Home Demonstration Forest. The majority of non-Forest Service harvest has been single tree selection which is likely to retain significant habitat elements for fisher. At the project scale, completion of the Tobias Project in Alternative 2 will reduce the quality of fisher habitat in the short-term, but is unlikely to result in abandonment of the area or reduction in reproductive success. Essential structures (large trees and snags) for resting and denning are retained and canopy cover density class changes will occur on only a small portion of the area. Since the Regional fisher monitoring program provided evidence that post treatment habitat continues to provide suitable habitat for fisher (USDA-FS, 2014), we expect the primary effect to be temporary disturbance during project activities.

The individual units are relatively small compared to a fisher home range such that displacement of an individual from a territory is unlikely even in the short term. A limited operating period is in place to protect fishers and kits during denning when they are least mobile and most vulnerable. As such it is unlikely that there would be a significant cumulative effect on habitat availability or occupancy of fisher within the planning area from implementing either of the action alternatives. When considering the reasonably foreseeable actions within several larger scales of reference, there is no indication in space or time of cumulative impacts that would have a significant effect on the viability of the fisher within the planning area with the exception of the potential for large-scale, stand replacing wildfire. Overall, the proposed projects, including the Tobias Project, have the potential to reduce potential large-scale and long duration effects of wildfire.

DETERMINATION

Alternative 1

It is determined that Alternative 1 (No Action Alternative) for the Tobias Project ***will not affect*** **fisher** as a result of vegetation treatments, as none would occur under Alternative 1. However, no action poses a risk of large scale habitat loss and severe or stand replacing effects which could be long-term (decades to hundreds of years depending on size and intensity), difficult to mitigate and could increase habitat fragmentation and loss of connectivity or complete loss of this segment of the population. The ability of land managers to suppress wildfire will be less than under the proposed action.

Alternative 2

The implementation of Alternative 2 would slightly reduce quality of the habitat for fisher in the short-term (based on CWHR 2.1 habitat scores falling from 0.82 to 0.76). However, all the acres would remain in the moderate-high suitability category based on the model. Actions in this alternative would not result in significant reductions of the quantity or quality of fisher habitat (CWHR 2.1 habitat) at the unit level, planning area level, southern Sierra fisher sub population level or at the regional level for the Southern Sierra Fisher Conservation Area.

More than adequate levels of intermediate and large trees that provide potential den and rest sites will be maintained under Alternative 2. A few individual fishers may be disturbed by project activities, although this will only be for the short-term duration of those actions. The project will not impede movement or dispersal to other currently connected suitable habitat areas because habitat connectivity will be maintained within and adjoining the project area.

Design features in this alternative will maintain average canopy closure of at least moderate suitability (40%) immediately post treatment, and these prescriptions focus on thinning from below. There is a projected short-term drop in canopy closure to 50 percent as a result of thinning. However, changes in canopy cover are relatively quick to recover (Zielinski, et al., 2004c) and all affected moderate to highly suitable fisher habitat remains within the high to moderate rating using the CWHR 2.1 standard for fisher habitat suitability. The modeling done by Spencer et al. (Spencer, et al., 2008) also indicates that the consequences of actions such as implementation of the Tobias Project have a very low potential for adverse effect on the Southern Sierra Fisher Population and that inaction has the potential for significant adverse effect on fisher.

Alternative 2 may result in long-term positive effects to the fisher by: 1) reducing the potential for uncharacteristically severe wildfires; and 2) promoting the growth and re-growth of understory vegetation, which provides forage for prey species. Over the long term, implementation of this project would likely increase resistance to large scale change and resilience in the face of disturbances. All of these factors combined outweigh the short-term negative effects of treatments (due to immediate partial loss of forest biomass and disturbance), especially considering that a more severe fire regime is predicted for the future, and without fuels reduction, large scale, stand replacing wildfires would most likely cause serious and significant impacts to the population.

Therefore, it is determined that implementation of Alternative 2 of the Tobias Project as designed ***may affect individuals, but is not likely to contribute to the need for Federal listing or result in loss of viability*** of fisher in the Sequoia National Forest. This determination is based on the limited scale of changes to habitat quality. The modifications would be of low intensity and not a sharp difference from existing or adjacent conditions as far as availability of large trees and canopy cover. No mortality of individual fishers is likely to occur because of implementation of this project.

Alternative 3

No loss of acres considered moderate to high quality fisher habitat are predicted to occur following treatments in Alternative 3. The CWHR fisher habitat score would be slightly lower (0.78) than in the No Action Alternative (0.82). Alternative 3 would not result in reduction of that habitat (CWHR 2.1 habitat) at the unit level, planning area level, southern Sierra fisher sub population level or at the regional level for the Southern Sierra Fisher Conservation Area.

Given that only trees <8” dbh will be removed in this alternative, intermediate and large trees that provide potential den and rest sites, will remain at the same level as the No Action Alternative. A few individual fishers may be disturbed by project activities, although this will only be for the short-term duration of those actions. The project will not impede movement or dispersal to other currently connected suitable habitat areas because habitat connectivity within and adjoining the project area will not change from the No Action Alternative.

Alternative 3 may also result in long-term positive effects to the fisher by: 1) reducing the potential for uncharacteristically severe wildfires; and 2) promoting the growth and re-growth of understory vegetation, which provides forage for prey species. Over the long term, implementation of this project would maintain current levels of rest sites and tree size, and increase resistance to large scale change and resilience in the face of disturbances. All of these factors combined outweigh the short-term negative effects of treatments (due to immediate minimal loss of forest biomass and disturbance), especially considering that a more severe fire regime is predicted for the future, and without fuels reduction, large scale, stand replacing wildfires would most likely cause serious and significant impacts to the population.

Therefore, it is determined that implementation of Alternative 3 of the Tobias Project ***may affect individuals, but is not likely to contribute to the need for Federal listing or result in loss of viability*** of fisher in the Sequoia National Forest. This determination is based on scale: no changes in moderate to high fisher habitat suitability; and intensity: the modifications would be of low intensity and not significantly different from existing or adjacent conditions as far as availability of large trees and canopy cover. No mortality of individual fishers is likely to occur because of implementation of this project.

AQUATICS AND FISHERIES

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects to aquatics and fisheries in the Tobias project area. The effects analysis addressed the following the following four (4) concerns.

Indicator 1: Levels of ground disturbance in riparian areas, stream bank disturbance or disturbance of meadow edge or streamside habitats within the project area.

Streamside and meadow edge forest habitats are extremely complex ecosystems that help provide optimum food and habitat for stream communities and function as a filter by removing sediment and other suspended solids from surface runoff and shallow groundwater. These habitats provide shading for streams to optimize light and temperature for aquatic plants and animals. They function as a source of dissolved carbon compounds and organic detritus critical to the processes within the stream itself. Well-shaded upland small streams have as much as 75% of the organic food base supplied from the forest canopy where the base of the aquatic food chain is formed. While riparian areas can provide course woody material to streams, removal of large trees from the area will reduce the source of large wood (Fetherston et al. 1995) for insects, resting areas, deeper holes and other components of habitat for amphibians. Riparian areas influence temporal and physical properties of sediment influx into the stream channel (Hicks et al. 1991), regulate stream temperature (Beschta 1997), define channel structure and function by contributing woody debris and aiding in bank stability, and mediate allochthonous and autochthonous energy pathways by affecting the amount of incident sunlight and controlling the amount and timing of organic matter entering and leaving the stream (Naiman and Decamps 1990, Perkins and Hunter 2006).

When areas outside riparian corridors are disturbed, riparian buffers filter some impacts; however stream and riparian habitat conditions can become degraded in the short or long term. As riparian areas become unable to filter properly, sedimentation in streams results in a reduction in interstitial spaces that can affect reproductive success in fish and amphibian populations, depress growth rates from lost foraging space, and expose individuals to increased predation (Perkins and Hunter 2006). Streams function to provide permanent water for development of tadpoles and refugia for young frogs during the hot summers. Moist areas within meadows provide habitat for juvenile or adult frogs.

Alternative 1: This Indicator for ground disturbance suggests no short term or long term direct or indirect effects of this on mountain yellow-legged frogs.

Alternative 2: This Indicator for ground disturbance suggests that this alternative may affect mountain yellow-legged frog and its breeding, and foraging habitat; but with careful attention to reducing erosion and sedimentation, following all the design features and BMPs, this alternative should not have an adverse effect on MYLF or its suitable habitat.

Alternative 3: This Indicator for ground disturbance suggests that this alternative may affect mountain yellow-legged frog and its breeding, and foraging habitat but is not likely to adversely affect the MYLF or its habitat if careful attention to implementation of design features and BMPs.

Indicator 2: Changes in connectivity of habitat between breeding and foraging or dispersal habitat.

Riparian areas can increase connectivity for wildlife (Cushman 2006). The areas between perennial and intermittent streams, ephemeral streams, and meadows and seeps across the landscape are part of the complex of habitats for MYLF. Hydrologic connectivity is important to maintain habitat in perennial intermittent and ephemeral streams and meadows. Habitats within 984 feet of one another are considered habitat for foraging or can be used for dispersal in the wet season. These frogs can move farther than this during dispersal. Connectivity among these habitats is influenced by ephemeral streams and other temporally variable habitats across the landscape which function during the wet season and during the wettest years.

Alternative 1: This Indicator suggests no long term direct effects of this alternative on connectivity of habitat for mountain yellow-legged frogs.

Alternative 2: This Indicator of habitat connectivity indicates that connectivity for mountain yellow-legged frogs is likely to improve where the roads through meadows are closed. Connectivity will likely be affected positively over the long term by decommissioning of roads.

Alternative 3: This Indicator of habitat connectivity indicates that connectivity for mountain yellow-legged frogs is likely to improve where the roads through meadows are closed. Connectivity will likely be affected positively over the long term by decommissioning of roads.

Indicator 3: Severity of fire – risks to riparian areas and streams and meadows.

Riparian areas can be resistant to low to moderate fire but are vulnerable to crown fires. The areas between perennial and intermittent streams, ephemeral streams, and meadows and seeps across the landscape are part of the complex of habitats for these amphibians. When these areas are subjected to moderate to severe fire the soil and understory vegetation and downed wood are all changed. Severe fire can eliminate shade, warm streams, destroy refugia, destroy connectivity of habitat by removing vegetation and downed wood, and increase ash and sediment movement into the streams.

Alternative 1: This Indicator of fire risk indicates that risk of severe fire for mountain yellow-legged frogs is likely to worsen as fuels build up in the watershed. The actual risk is unknown at this time.

Alternative 2: This Indicator of fire risk suggests that risk of severe fire for mountain yellow-legged frogs would be reduced by fuels reduction activities in the watershed. Design features will reduce the short term effects, and fuels reduction activities in the RCAs will help reduce risk over the next decade. The long term indirect effects of reducing risk of severe fire should be beneficial to both suitable habitat and individuals.

Alternative 3: This Indicator of fire risk suggests that risk of severe fire for mountain yellow-legged frogs would be reduced by activities in the watershed. Design features will reduce the short term effects, and fuels reduction activities in the RCAs will help reduce risk over the next decade. The long term indirect effects of reducing risk of severe fire should be beneficial to both suitable habitat and individuals.

DETERMINATION

After reviewing the current status of the Northern Distinct Population Segment of the mountain yellow-legged frog, the environmental baseline for the action area, the direct and indirect effects of the proposed action, cumulative effects, the design features, it is my conclusion that the action alternatives as currently proposed under the Tobias Project, should not adversely affect suitable habitat, mountain yellow-legged frogs or proposed critical habitat. My determination is that the Tobias Project Alternative 2 and 3 **May Affect but is Not Likely to Adversely Affect the mountain yellow-legged frog or its suitable habitat.** It is also my determination that the Tobias Project action alternatives will **Not Affect proposed Critical Habitat for the mountain yellow-legged frog.**

RECREATION

ENVIRONMENTAL CONSEQUENCES

DIRECT AND INDIRECT EFFECTS NATIONAL FOREST TRANSPORTATION SYSTEMS (NFTS)

Alternative 1 (No Action)

No direct, indirect, or cumulative effects would result, as no change would be made from the current management situation. Motorized use and motorized access would remain the same as it is currently. No direct, indirect, or cumulative effects would result, as there would be no disruption to non-motorized activities if the project is not implemented.

Alternatives 2 and 3 (Action Alternatives)

Changes to the NFTS may have both positive and negative effects on recreation opportunity in both the short (1 year) and long (10 years) term. Changes to motorized opportunity would occur for 17 roads (See Table 77). Fifteen roads (totaling approximately 8.5 miles) would be decommissioned. Two roads (24S8 and 24S83) would be converted to trails (totaling approximately 2.8 miles) and would be wide enough to accommodate vehicles up to 50 inches in width. Eleven roads to be decommissioned are currently not open for public motorized use and four roads are currently open to both highway legal and non-highway legal vehicles (e.g. OHV vehicles).

Indicator Measure: Motorized Recreation Opportunity

In the project area, prohibiting motorized use and the decommissioning of four roads currently open to motorized use would result in reduction of 2.8 miles of road or an approximate 34 percent reduction of motorized recreation opportunity for roads in which highway legal and non-highway legal vehicles are acceptable, both in the short-term and long-term. The remaining 11 roads proposed for decommissioning are currently not open for motorized public use.

Table 78. NFTS Roads Open for All Vehicle Types – Proposed for Decommissioning

NFTS Road	Length (miles)
24S34A	0.4
24S37	1.1
24S80A	0.9
24S80C	0.4
Total Miles	**2.8**

According to the Sequoia National Forest and Giant Sequoia National Monument Travel Analysis Process Report (TAP), site visits by Forest Service staff and comments from the public; these roads are used for driving pleasure. Further, these roads had a moderate demand for the pursuit of personal hobbies (including hunting and fishing access) or spiritual values except for Tyler Meadow (24S34A), which had no known uses identified or any desire to have the road open for access. These uses and values would be forgone, as these roads would be decommissioned under both action alternatives.

In the long term, decommissioning the fifteen roads (including those are currently not open for public motorized use) would forgo any future consideration for use associated with motorized activities: Under both action alternatives, all roads identified for decommissioning would have roadbeds converted to a more natural state.

Use of large motorized vehicles (greater than 50 inches) on the two roads identified to be converted to trails would be eliminated, reducing motorized recreation use in the project area for this size of vehicles by 2.8 miles (approximately 9 percent of the road mileage available for these type of vehicles). Motorized recreation opportunity for legal vehicles smaller than 50 inches would remain the same by the conversion of two roads to trails (totaling about 2.7 miles); since these roads are currently open to these types of vehicles.

Indicator Measure: Motorized Access to Dispersed Recreation

According to the TAP, site visits by Forest Service staff and certain comments from the public, roads currently open for motorized use for all vehicle types (included in Table 3) provide access for dispersed recreation. Any existing dispersed sites that have noticeable signs of dispersed camping use (such as rock fire rings) would not be accessible by vehicle, in the short or long term. Decommissioning of all fifteen roads would forgo any future consideration for accessing dispersed recreation associated with these roads. An increase in dispersed camping would most likely occur at Panorama Campground, which is a dispersed camping area within the project area.

Recreation Indicator Measure: Impacts to non-motorized recreation.

The decommissioning of the five roads listed in Table 3 would decrease vehicular noise and dust associated with vehicular use of these roads to some extent in both the short-term and long term. All roads targeted for decommissioning (including those that currently not open to legal motorized use) would no longer serve as foot paths as they currently exist if affected routes are returned to a more natural state.

Direct and indirect effects to Non-Motorized recreation Associated with Vegetation Treatments

Two NFTS trails within the project area would be affected during certain phases of implementation. Ground disturbance to the trail tread and temporary closure (for public safety) of about ½ mile of the Sunday Peak Trail and the entire Portuguese trail within the project area would occur during tractor or cable logging activities under Alternative 2 and prescribed burning, tree falling and hand piling activities would result in temporary closures under Alternative 3. Closure of treatment units would occur at some point during implementation under both Alternatives, which would affect recreation opportunity (such as hunting and hiking cross country) temporarily.

Cumulative Effects for All Alternatives

The cumulative effects analysis will consider impacts of the alternatives when combined with past, present, and foreseeable future actions that could affect motorized recreation, motorized access to dispersed recreation, and non-motorized recreation. The geographic scope is the project area. The temporal scope is 10 years.

Indicator Measures: Motorized Recreation Opportunity and Access to Dispersed Recreation and Non-Motorized Recreation.

Past impacts associated with motorized recreation and access to dispersed recreation during the last ten years includes the signing of the Sequoia National Forest Travel Management Record of Decision which further restricted all motorized use to trails, roads and open areas (i.e. no cross-country travel). Within the project area, although some NFTS roads were closed as a result of the Record of Decision, others were made available for all vehicle types (including OHVs) for a net loss or gain of zero. There are no present or future actions planned within the project area that would affect motorized recreation, motorized access to dispersed recreation or non-motorized recreation use.

Comparison of Alternatives

The actions proposed under Alternatives 2 and 3 would have the same effects to motorized recreation opportunity and access to dispersed recreation regarding road decommissioning and converting two roads to trails. Under Alternative 2, there would be a greater disruption for those using the NFTS trails within areas that are being treated mechanically; trails or sections of trail would be closed temporarily for public safety and for reconstruction. Under Alternative 3, treating the areas by hand or by prescribe burning would have less of a disruption on general recreation use in the project area, since there would be less disturbance to NFTS trails and less of a need to close NFTS trails for public safety.

OTHER FORST SERVICE ACTIONS AND ACTIVITIES.

Fire History: Since the Stormy Fire of 2000, no further wildfires have occured within any of the cumulative effects analysis areas established for the species addressed.

Recreational Activity: Recreation activities are similar within each CE analysis areas, and are generally tied to road and trail related activities such as hiking, equestrian, off highway vehicle or over the snow vehicle (OHV/OSV) uses and hunting.

Livestock Grazing: The majority of the established cumulative effect analysis areas allow for livestock grazing under permit.

SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16) is required by NEPA. This includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generation of Americans (NEPA, Section 101). Discussion related to short-term uses and long-term productivity can be found in detail in the effects analysis discussions for the individual resources throughout this chapter.

Alternatives 2 and 3 would implement ecosystem restoration activities that could produce the greatest amount of short-term effects to soil and water quality, while providing the greatest long-term benefits in terms of prevention of and protection from wildfire. In contrast, in the event of a wildfire under extreme weather conditions, Alternative 1 could produce a great amount of short-term effects to soil and water quality, while providing limited long-term benefits in terms of prevention of and protection from wildfire.

UNAVOIDABLE ADVERSE EFFECTS

There are no known unavoidable adverse effects from implementing either action alternative.

Irreversible and Irretrievable Commitments of Resources

There are no known irreversible or irretrievable commitments of resources from implementing either action alternative.

Other Required Disclosures

The National Environmental Policy Act directs that "to the fullest extent possible, agencies shall prepare draft EIS's concurrently with and integrated with…other environmental review laws and executive orders" (40 CFR 1502.25(a)).

In accordance with the Endangered Species Act, the Tobias planning team would consult as necessary with the U.S. Fish and Wildlife Service throughout the development of the draft and final EIS regarding the California condor, mountain yellow-legged frog, Pacific fisher and any other species that become known in the project area. Should satellite data suggest presence of condors on the forest that would result in occupation of the Tobias vicinity, a limited operating period would be implemented in consultation with the Condor Recovery Team. The draft EIS was sent to officials of the U.S. Fish and Wildlife Service for their review and comments.

Consultation with the National Marine Fisheries Service is not required due to the absence of anadromous fish and their habitat.

Legal and Regulatory Compliance

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …environmental review laws and executive orders." The proposed action and alternatives must comply with the following:

Principal Environmental Laws

Endangered Species Act – The Biological Assessment (BA) which is one of four documents completed for the assessment of wildlife resources as part of the Tobias Project analysis. The BA documented the review of the potential effects of species classified as federally endangered or threatened under the Endangered Species Act. The proposed action and other action alternative complies.

Clean Water Act – Standard and guidelines for riparian conservation areas, streamside management zones, and soils are will be carefully and intentionally followed during implementation of any activities described in both action alternatives.

Clean Air Act – The proposed action and other action alternative would comply with the Clean Air Act as outlined in air quality section of this DEIS.

National Historic Preservation Act – The proposed action and other alternative would comply with the National Historic Preservation Act as described in the design features and cultural sections of the DEIS.

National Forest Management Act – The proposed action and alternative does comply with the National forest Management Act as described in chapter 1 of the DEIS.

Executive Orders

The following Executive Orders provide direction to federal agencies that apply to the proposed action and alternatives:

Indian Sacred Sites, Executive Order 13007 of May 24, 1996 is covered under the cultural resources section of the draft Environmental Impact Statement (EIS). Design features include flag and avoidance of any sacred Indian sites located within areas where treatment activities are proposed. Invasive

Invasive Species, Executive Order 13112 of February 3, 1999 is covered in botany section of this document. The implementation of both action alternatives can introduce invasive species into the project area. However, mitigation measures and design features are in place to prevent the spread and introduction of invasive species.

Recreational Fisheries, Executive Order 12962 of June 6, 1995 are not addressed in this draft Environmental Impact Statement (DEIS).

Migratory Birds, Executive Order 13186 of January 10, 2001 are not addressed in the DEIS.

Floodplain Management, Executive Order 11988 of May 24, 1977 is covered in the hydrology, aquatics, and wildlife sections of the DEIS. The activities proposed in both action alternatives are mitigated to not have a negative effect on floodplains. Best Management Practices (BMP) and standard and guidelines from the Forest Plan for riparian conservation areas and streamside management zones will be followed to ensure protection of floodplains during implementation of any of the proposed activities.

Protection of Wetlands, Executive Order 11990 of May 24, 1977 are covered under the hydrology and aquatics sections of the DEIS. Implementation of design features, BMP's, and standard and guidelines for wetlands are included in the DEIS.

Environmental Justice, Executive Order 12898 of February 11, 1994 was not covered in this DEIS.

Use of Off-Road Vehicles, Executive Order 11644, February 8, 1972 is covered under the transportation, economic, recreation, and design features sections of this DEIS.

Special Area Designations

The selected alternative will need to comply with laws, regulations and policies that pertain to the following special areas:

Research Natural Areas – There are no research natural areas within the Tobias project area.

Inventoried Roadless Areas – There are not any inventoried roadless areas within the project area.

Wilderness Areas – There are no wilderness areas within the project area.

Wild and Scenic Rivers – There are no wild and scenic areas within the Tobias project area

Municipal Watersheds (FSM 2540) – There are no municipal watersheds within the Tobias project area.

Chapter 5. Consultation and Coordination-Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental statement:

Interdisciplinary Team

Dave Ernst – District Fuels Officer

Education: B.A. Mathematics, California State University Northridge. Various agency provided training including: S-490 Advanced Fire Behavior Calculations, RX-310 Introduction to Fire Effects, and RX-341 Prescribe Fire Plan Preparation.

Experience: 20+ years of wildland firefighting with the Forest Service. Has been in current position since January 2012.

Fletcher Linton – Botanical Resources and Invasive Plants

Education: M.S. Soil Science emphasizing forest soil ecology, Washington State University, Pullman; B.S. Ecology and Systematic Biology, with a concentration in Ecology and Plant Systematics, California Polytechnic State University, San Luis Obispo.

Experience: Fletcher has been the forest botanist for 11 years. He worked for Bryce Canyon National Park as Park botanist. He has worked as a botanist, soil scientist, or ecologist on national forests in Washington, Colorado, and California. He also served as a natural resources volunteer with the Peace Corps in Bolivia for 2 years.

George Powell – Vegetation Management specialist and Giant Sequoia Ecology

Education: George was educated at Cal Poly San Luis Obispo, Colorado State University at Fort Collins, Utah State University at Logan, and Northern Arizona University in Flagstaff.

Experience: George has worked on the Sequoia National Forest for about 30 years. He has been a certified silviculturist for one half of that time, and Ecosystem Manager of the Western Divide Ranger District for one third of that time.

Joe Loehner – District Natural Resource Specialist

Education: B.S. Biology, Chemistry Minor, California State University, Bakersfield.

Experience: Joe has served as the natural resource specialist for the Western Divide Ranger District since 2001 specializing in range, botany, noxious weeds, wildlife, and GIS. Joe had worked in the private sector in farming and ranching prior to his return to college and Forest Service career

Joshua Courter – District Hydrologist

Education: B.S. Geology, California State University, Bakersfield; Research and Educational Center for River Studies; Wildland Hydrology, Inc.

Experience: Joshua has been the district hydrologist for 8 years on the Sequoia National Forest and SCEP hydrologist for 5 years.

Linn Gassaway – Cultural Resources, Tribal and Native American Interests

Education: M.A. Anthropology, San Francisco State University; B.A. Anthropology University of California, Berkeley.

Experience: Linn is currently the Giant Sequoia National Monument and North Zone Archaeologist for Sequoia National Forest covering Hume Lake and Western Divide Ranger Districts. She has 12 years working for the Forest

Service on four forests in 4 regions. She has 7 years with the National Park Service, 1 year as an archaeologist with the Texas National Guard, and 2 years as an archaeologist for private cultural resources management companies.

Robin Galloway – District Wildlife Biologist

Education: B.S. Biology, California State University, Bakersfield.

Experience: Robin has been a wildlife biologist for Sequoia National Forest for 26 years specializing in Threatened, Endangered and Forest Service sensitive species management. Prior to her Forest Service career she worked for the California Department of Fish and Wildlife with the Little Kern golden trout project, and for Entrix a private consulting company.

Emilie Lang – Forest Wildlife Biologist

Education: M.S. Natural Resources, Humboldt State University; B.S, Wildlife Management, Humboldt State University.

Experience: Emilie has been the Sequoia National Forest wildlife biologist for 5 years. She was a biologist with the naval base at Ventura County Point Mugu with the U.S. Navy for 6 years.

Federal, State, and Local Agencies: Us Fish and Wild Life Services

Tribes: Tule River Native America

Others:

Distribution of the Environmental Impact Statement

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been sent to the following Federal agencies, federally recognized tribes, State and local governments and organizations:

American Forest Resource Council
- Jerry and Sue Jensen

San Joaquin Valley Air Pollution Control District
- Amaub Marjollet

Portuguese Pass Property Owners
The Aerie Preserve
Sierra Forest Products
Stewards of the Sequoia
- Chris Horgan

Kern River Mountain Bike Association (KRMBA)
- Allison Diller

Sequoia ForestKeeper®, the Kern-Kaweah Chapter of the Sierra Club, and Western Watersheds Project
- René Voss – Attorney at Law
- Ara Marderosian – Executive Director

John Muir Project- Center for Biological Diversity
- Chad Hanson, John Muir Project of Earth Island Institute
- Justin Augustine, Attorney for Center for Biological Diversity

California Chaparral Institute
- Sebastian J. Revels

Joan Stewart
Dick Artley
Gregg Kaylor
Steve Hylton
Eugene Hacker
Ed Royce
Marcy Parmley
Michelle Ray
Briana Powers
Rick Wilson
Mary Mclain

Advisory Council on Historic Preservation

Chief of Naval Operations (N45)

Federal Aviation Administration

Federal Highway Administration

NOAA Fisheries Service, SW Region

Rural Utilities Service (RUS)

Tule River Indian Tribe

US Army Corps of Engineers

US Coast Guard Commandant CG-47

US Department of Energy

US EPA, Office of Federal Activities

US EPA, Region 9

USDA APHIS PPD/EAD

USDA, National Agricultural Library

USDA, Natural Resources Conservation Service

USDA, Office of Civil Rights

USDI, Office of Enviro Policy & Compliance

USDI, Fish and Wildlife Service

National Environmental Coordinator, NRCS

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GLOSSARY

- **Basal Area (BA) –** See Appendix B, this document for explanation; the cross-sectional area of all stems in a stand measured at breast height (4.5 feet) and expressed per unit of land area, generally square feet per acre.
- **California Wildlife Habitat Relationship (CWHR)** – A vegetative classification system developed in California to classify wildlife habitats and vegetative structures.
- **Canopy base height** is the average distance from the ground to the lowest portion (base) of the tree crown.
- **Canopy cover: -** the ground area covered by tree crowns expressed as a percent.
- **Channel type** is a way of classifying streams using various criteria including the geomorphology (such as channel pattern, sinuosity, slope, and stream bed materials), and the stream state (such as erosion potential, riparian vegetation, and whether it is in a stable state). The geomorphological characteristics are displayed in an alpha numeric code with the alphabetic portion based on the channel pattern, sinuosity and slope (A-F); and the numeric portion based on stream bed material (sand, cobble, boulder, etc.) (1-6).
- **Diameter @ Breast Height (DBH)** – height at which tree diameter is normally measured specified as 4.5 feet above ground base of the tree.
- **Equivalent Roaded Acres** (ERAs) is a standard factor used in the Sequoia National Forest Cumulative Watershed Effects Model, which assesses area compacted and the associated recovery rate.
- **Hand treatments** – treatments including use of small tools like chainsaw.
- **Hydrologic Unit Codes** (HUCs) were designated by the United States Geological Service (USGS) in conjunction with other agency input.
- **Individual tree selection**– removal of individual trees based on project objectives.
- **Jackpot Burning** is a type of controlled burn where the larger concentrations of slash or other down material, sometimes in piles, are ignited, and then the fire is allowed to work its way through the surface fuels and creep through the unit.
- **MIS Category 3** is a determination made using the Sierra Nevada Forests MIS Amendment Record of Decision (SNF MIS Amendment) (USDA 2007) to distinguish MIS whose habitat would be either

directly or indirectly affected by the project, from MIS with no habitat in the area (Category 1), or whose habitat, though in the area, would not be directly or indirectly affected by the project (Category 2).

- **Pounds per Square Inch (PSI):** The number of pounds of ground pressure exerted over one square inch of soil; a metric to assess soil compaction and to define equipment limits.

- **Quadratic Mean Diameter (QMD):** The square root of the arithmetic average of the squared values across a particular inventory (Avery and Burkhart 2002).

- **Shade-intolerance** – Species that do not have a tolerance to shading by other species. Shade intolerant species will not regenerate under a stand’s over-story.

- **Shade-tolerance** – Species that have a tolerance to shading by other species. Shade tolerant species will grow and regenerate under a stand’s over-story.

- **Silviculture** – The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.

- **Stand density index (SDI):** See Appendix C of the vegetation report document for a detailed explanation. SDI is a metric for measuring forest stand density. For this document, averages are reported within the treatment units, where stand examination inventories have been conducted. This is an FVS modeled average for this document.
- **Threshold of Concern** (TOC) is expressed as a percentage (percent of ERAs used) and represents the potential risk to the subwatershed from erosion or compaction, as it approaches and exceeds its threshold.